ANNALS OF MEDICAL HISTORY

PUBLISHED BIMONTHLY

NEW SERIES, VOL. VII, NO. 4 JULY, 1935 WHOLE NO. 80

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NEW YORK
PAUL B. HOEBER, INC., PUBLISHERS
SEVENTY-SIX FIFTH AVENUE

ANNALS OF MEDICAL HISTORY

New Series, Vol. VII, No. 4 JULY, 1935 Whole No. 80

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Original articles are published only with the understanding that they are contributed exclusively to the ANNALS OF MEDICAL HISTORY. Manuscripts offered for publication, books for review, and all correspondence relating to the editorial management should be addressed to the Editor, Dr. Francis R. Packard, 302 South 19th Street, Philadelphia, Pa.

Communications regarding subscriptions, reprints, and all matters regarding the business management of the ANNALS OF MEDICAL HISTORY should be addressed to the publishers, Paul B. Hoeber, Inc. 76 Fifth Avenue, New York City. [Cable address, Formed N. Y.]

The ANNALS OF MEDICAL HISTORY is published six times a year, the six issues comprising one volume. No advertising is carried. The subscription price is $10.00 a year, foreign $11.00. Current single numbers $2.50 per copy. A few sets of first series, Volumes I–X, are available in parts as published at $100.00 per set, or bound in boards, paper sides, canvas back, paper label, $135.00 per set. Price on available single volumes or numbers will be quoted on request.

Entered as second class matter, June 2, 1917, at the Post Office, New York, N. Y., under the Act of March 3, 1879.

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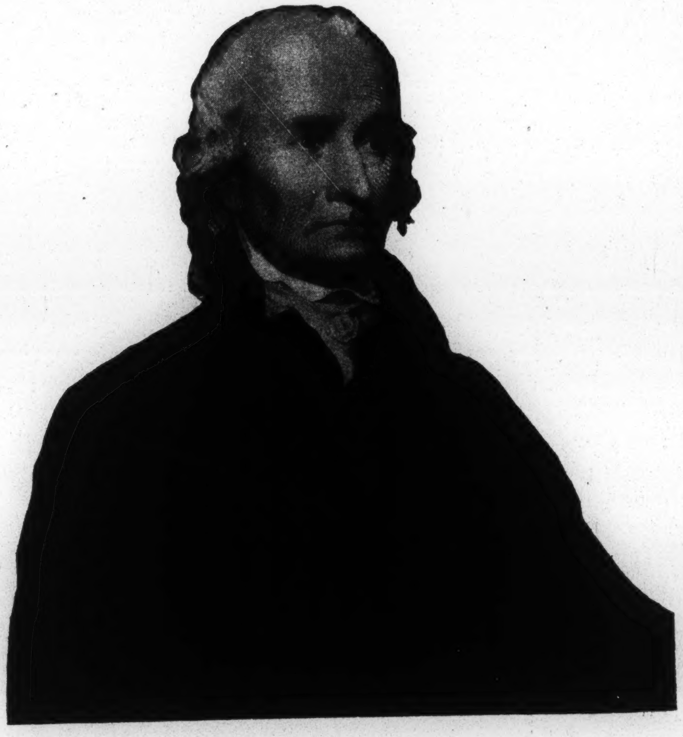
Frontispiece
Annals of Medical History
July, 1935



HUGH WILLIAMSON

[1735-1819]

SINAI HOSPITAL

[From Galen: De Simplicium. Venice, 1625.]

ANNALS OF MEDICAL HISTORY

New Series, Volume VII July, 1935 Number 4

WILLIAM BULL, M.D. (1710–1791)

LIEUTENANT-GOVERNOR OF SOUTH CAROLINA UNDER THE ROYAL GOVERNMENT*

By ELEANOR WINTHROP TOWNSEND, M.D.

CHARLESTON, S.C.

PHYSICIANS were among the very early English settlers in South Carolina, two, Dr. Henry Woodward and Dr. William Scrivener, having come with the first English settlers in 1669,[1] and at least twenty having been in the province before 1700.[2] Yet more than sixty years were to elapse before a native-born son of Carolina should be graduated in medicine, and to him has been accorded the distinction of being the first son of the American Colonies to receive this degree.[3,4] This was William Bull, the younger, who was born in 1710 at Ashley Hall, near Charles Town, South Carolina, and who was graduated at Leyden in 1734.

Among the early settlers in South Carolina, one who was to establish there an illustrious family, important in the history of the Province and the State, was Stephen Bull,[5] a deputy of the Lords Proprietors, and surveyor general of the Province, who emigrated in 1669 from Kinghurst Hall, County Warwickshire, England. He explored extensively among the Indians, having been in 1671 chosen Caseeka of the Etiwans, and later in 1696 was appointed by Governor Archdale to make a treaty with the Indians of the North Carolina coast. In 1671 he established his home on a grant of about 1000 acres of land west of the Ashley River, lying northwest of the land of William Branford, which was the site of the present "Old Town Plantation." In this home in the New World, was born in 1683, the eldest of his four children, William, later known as William Bull of Ashley Hall and Sheldon. The latter home, named from that of his great grandfather, William Bull[6] of Sheldon Hall,

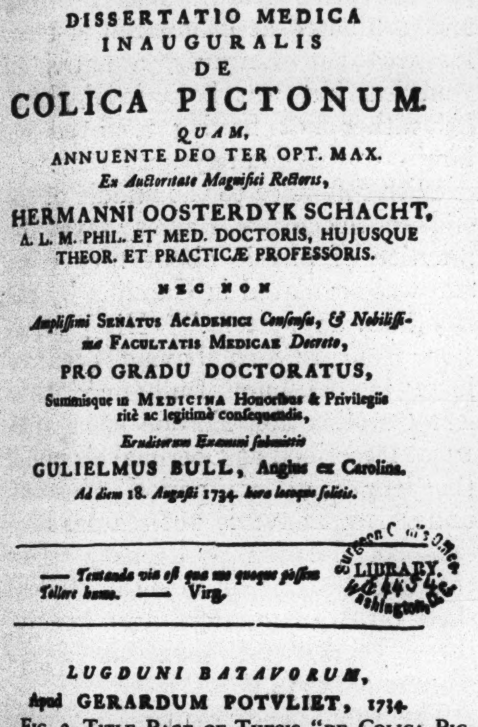
---

* Read before the Medical History Club, Charleston, S. C., January 4, 1934.

Warwickshire, near Coleshill in England, was built on a grant of land south of the Combahee River, in the center of a great rice and indigo section, which contributed greatly to the wealth of the Province. William Bull did much to erect Sheldon Church,[7] Prince William Parish, the finest church then, and the most beautiful ruin now, to be found in the Carolinas. Sheldon Church and the home were burned by Prevost in 1780, and of the house, which was rebuilt and burned again in 1865 by Sherman's troops, no trace now remains. This William Bull died at Sheldon in 1755 and his resting place cannot be found.

Fig. 1. Ashley Hall, Home of William Bull, Near Charleston, S. C. From a Sketch Made by Charles Fraser in 1903. Reproduced from Fraser's Sketchbook through the Courtesy of Miss Alice R. Huger Smith.

Most of his life, however, was spent in or near Charles Town, then the capital of the province, where he was a member of the Commons House of Assembly under the Lords Proprietors, and later of the King's Council; and still later (1737–1743) was Lieutenant-Governor. His town residence,[8] built about 1740,[9] stands today, at the northwest corner of Meeting and Ladson streets; but his home life was lived at Ashley Hall. Here, between 1722 and 1724, he entertained the celebrated naturalist, Mark Catesby.[10] The collection of plants taken to England by Catesby on his return in 1719 from his first visit to America has been said to be the most perfect ever brought to that country, although the accuracy of some of his descriptions was criticized by so distinguished a botanist as Dr. Garden.[11] On his second visit,[12] he landed in Charleston, May 23, 1722, spent three years in Carolina, and after his return to England in 1726 prepared "A Natural History of Carolina, Florida, and the Bahama Islands, with observations on the Soil, Air, and Water," which was accompanied by a new map by himself of the district explored. The name of Catesby is perpetuated in the plant Catesbea, so named by Gronovius of Leyden. Gronovius numbered among his friends Doctor Thomas Dale of Charleston, and was bequeathed by Dale his collection of botanical specimens, which was sent to Leyden from Charleston after Dale's death.[13]



DISSERTATIO MEDICA
INAUGURALIS
DE
COLICA PICTONUM.
QUAM,
ANNUENTE DEO TER OPT. MAX.
Ex Auctoritate Magnifici Rectoris,
HERMANNI OOSTERDYK SCHACHT,
A. L. M. PHIL. ET MED. DOCTORIS, HUJUSQUE
THEOR. ET PRACTICÆ PROFESSORIS.
NEC NON
Ampliſſimi SENATUS ACADEMICI *Conſenſu, & Nobiliſſimæ* FACULTATIS MEDICAE *Decreto,*
PRO GRADU DOCTORATUS,
Summisque in MEDICINA Honoribus & Privilegiis
ritè ac legitimè conſequendis,
Eruditorum Examini ſubmittit
GULIELMUS BULL, Anglus ex Carolina.
Ad diem 18. Auguſti 1734. hora locoque ſolitis.

—— Tentanda via eſt qua me quoque poſſim
Tollere humo. —— Virg.

LIBRARY. Washington

LUGDUNI BATAVORUM,
Apud GERARDUM POTVLIET, 1734.

FIG. 2. TITLE PAGE OF THESIS "DE COLICA PICTONUM" BY WILLIAM BULL, M.D., LEYDEN, 1734. DEDICATED TO HIS FATHER, WILLIAM BULL, KINGS COUNCIL OF SOUTH CAROLINA. REPRODUCED FROM THESIS IN THE ARMY MEDICAL LIBRARY, WASHINGTON, D. C.

About 1704, this William Bull built the two-story brick house, at Ashley Hall which stood until destroyed by fire in 1865 at the hand of its owner, William Izard Bull, who sacrificed it to spare it the fate which had been met by other homes in the path of Sherman's advancing army. Its beautiful steps, cut in semi-circular shape from solid blocks of stone, are the only remaining trace of its ruin. Near them still stands the oldest building on the place, one story, and of brick, thick walled, with heavy door and solid shutters, built by his father Stephen Bull. In this house, in 1760, his son William Bull, the younger, as governor, was to sign the treaty which concluded a successful peace with Attakulla Kulla, chief of the Cherokees.

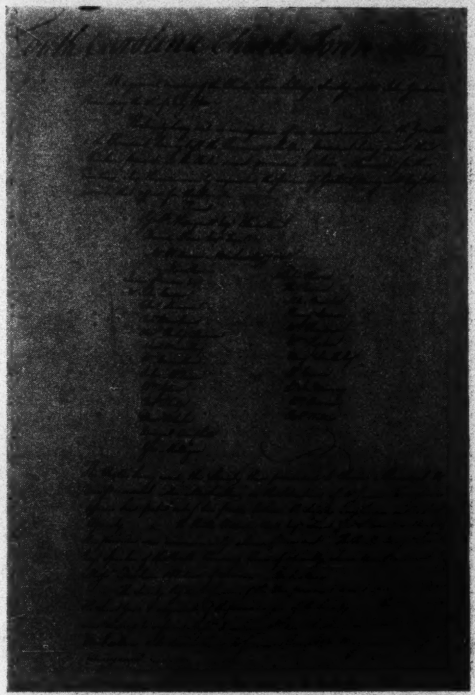


FIG. 3. MINUTES OF CHARLES TOWN LIBRARY SOCIETY RECORDING THE ELECTION OF WILLIAM BULL AS PRESIDENT. REPRODUCED FROM THE ARCHIVES OF THE CHARLESTON LIBRARY SOCIETY, CHARLESTON, S. C.

To William Bull, son of the emigrant Stephen, and his wife Mary Quintyne Bull, daughter of Richard and Mary Quintyne, five children were born, of whom William, born September 24, 1710, was the second. His early life was spent at Ashley Hall and while no account of his early education is available, he is mentioned as having been distinguished in his studies at home.[14]

The early colonists were not indifferent to provision for the education of children of the province. Steps to found libraries were taken by 1698, and an act of 1710 records the fact that gifts had already been made for founding a free school;[15] and the establishment of schools by religious and charitable organizations was already or soon after begun. Children of well-to-do families were instructed by tutors or governesses or in private schools. McCrady[4] states that "a knowledge of English, Latin, and Greek could be obtained in the Colony at any time after 1712."

FIG. 4. PORTRAIT OF WILLIAM BULL. FROM THE BASRELIEF UPON HIS MONUMENT AT ASHLEY HALL. PHOTOGRAPHED BY THE AUTHOR.

It was customary before the Revolution for families of wealth and prominent position in Carolina to send their sons across the Atlantic to be educated, and many received their university and professional education in England and Scotland. The number assembled in England for this purpose is historically illustrated in the celebrated remonstrance to the King in 1774, by the native Americans then residing in London. For of thirty who subscribed it, sixteen were Carolinians.[10] One of the earliest residents of Carolina to be graduated in medicine was George Smith, son of Landgrave Smith, born in 1672, and graduated at Edinburgh in 1700. He was not, however, a native of America, but was born in England, his father not having removed his family to this country until 1687.[4]

With reference to the middle of the eighteenth century, Ramsay says "the practice of physic about fifty years ago was regulated in Carolina by the Boerhaavian system."[16] His graduation from Leyden having occurred in 1734, William Bull may have left Carolina for Europe soon after 1730. Described as Boerhaave's pupil, the length of his period of study under Boerhaave is not stated. Records of Leyden University show that he became a medical student there on April 13, 1734, aged twenty-three years, and took his degree August 18, 1734.[17]

The prominence of the University of Leyden during the eighteenth century was the logical outgrowth of preceding years, for the most promising conditions for University development during the seventeenth century existed undoubtedly in Holland.[18] Her universities were for the most part city foundations and under the regulations of wealthy cities, exhibiting the knowledge-seeking attitude of a tolerant people. In 1700 freedom of the Press existed nowhere else as in Holland and England.

The University of Leyden was founded in 1575 by William of Orange as a reward for the heroic defense of that city in 1574; but according to tradition, at the will and material cost of its citizens, who were offered the choice between the University and certain tax exemption. Imbued with their spirit and fostered by the brilliant thought of great teachers, the influence of Leyden became that of an international institution and the steps of her achievements momentous. The teaching of anatomy was by dissections, in the anatomic theater built in 1610 under the direction of Pieter Pauw, who had been a student in Padua under Fabricius; and John Evelyn in 1641 described their anatomic repository as "well furnished with natural curiosities; skeletons from the whale and the elephant to the fly and spider." He adds: "amongst a great variety of other things I was shew'd the knife newly taken out of a drunken Dutchman's guts by an incision in his side after it had slipped from his fingers into his stomach. The pictures of the chirurgeon and his patient, both living, were there."[19] So successful demonstration of emergency surgery was not lacking.

Pieter Pauw gave instructions in botany. Van Helmont introduced gravimetric analysis of urine. His successor, Francis Sylvius de la Böe (1614–1672), great exponent of the iatrochemical theory, persuaded the curators of the university to build for him "a laboratorium as they call it."[18] To Van Heurne and Schrevelius is credit due for inaugurating, about 1630, in the infirmary at Leyden, the system of bed-side clinical instruction, whereby students first examined a patient and stated their views and last of all the professor confirmed or confuted and explained,—a plan transmitted through Leyden graduates to other teaching centers and since followed by succeeding generations of students and teachers of medicine. Autopsies to reveal the cause of disease and death were performed; and in the apothecary shop students were shown how to prepare medicines. By the eighteenth century the prestige of Leyden was long established and ably upheld.

In this environment William Bull studied medicine under Boerhaave. That he availed himself of its opportunities to great advantage, and with distinction, is testified by his fellow student, van Swieten, who later wrote in discussing the "Colic of Poitou":

> This colic is now so frequent in the South parts of America, that it may be almost reckoned an endemic disease there, as I have frequently been told by the learned doctor William Bull, who was born in that country and now practices physic there with great success. He likewise published a very ingenious thesis upon this disease which he defended in the Academy of Leyden in the year 1734.[20]

The "ingenious" thesis of William Bull is rendered no less interesting by the fact that the wide distribution of this disease, as well as its striking clinical manifestations, brought it to the attention of many medical writers. Described in the second century before Christ by Nikander, it was commented upon repeatedly, but Citois, publishing in 1616 his "Discussion of the New and Common, Painful Bilious Colic at Poitiers," did not fully understand its cause. That this was known to Boerhaave, and so to his pupils, is indicated by these lines quoted from James' English translation of Boerhaave's "Practice of Physic"[21]:

> There is also a violent spasmodic kind of colic, arising from the fumes exhaled from lead when working, taken into the mouth, and swallowed with the spittle. This species of disorder is very apt to terminate in a true palsy, or a spasmodic asthma, and very often torments the patient for a long time together. For this

> very reason medicines which have lead in their composition, as the tincture antiphthisica, or the magistery of lead, which quacks frequently use for the suppression of gonorrhea, leave behind them invincible costiveness attended with the most tormenting pain.

His discussion continues, however: "There is a kind of endemic and spasmodic colic incident to the inhabitants of Moravia, Austria, and Hungary the cause of which is nothing else than the drinking to excess of the highly spirituous wines of those countries, especially if attended with taking colds," so the etiology of cases due to the use of leaden wine vessels seems not yet to have been clear.

Perhaps the first report published in America was that of Thomas Cadwalader on "West Indian dry gripes," published by Benjamin Franklin in 1745.[22]

No reference has been found, save the remark of van Swieten which has been quoted from his "Commentaries," to indicate that William Bull ever practiced medicine. It appears from record, however, that he was referred to as *Doctor Bull* until he received the title of *the Honourable* when appointed Lieutenant Governor.[23] Upon his return to South Carolina he was before long drawn into the service of the province in public offices. He was commissioned Justice of the Peace and elected to the Commons House of Assembly for Berkeley County in 1736. He served in the House through 1749, being Speaker after 1740. In 1739 he was appointed Assistant Judge.[24] It might appear that assistant judges were appointed with more view to their scholarly or scientific attainments than to any especial education or experience in law, for Bull was preceded by Thomas Dale and followed by John Lining. Before 1739 Bull had served as a Captain in the Saint Augustine expedition and he filled other military appointments, rising in rank, up to 1759, when he was appointed Lieutenant-Governor.

Like his father and grandfather, he was successful in dealing with the Indians, being possessed of great wisdom, firmness and tact, and had great experience in Indian affairs, having been sent as Commissioner to an Indian Conference at Albany in 1752. Although he accompanied Governor Lyttleton on his expedition against the Cherokees in 1759, he had strongly advised against this move, which turned out to be but a hollow success. Assuming the government of the province on Governor Lyttleton's departure, April 16, 1760, he then organized forces, brought the Cherokees to submission, and concluded a satisfactory treaty with them, which was signed at Ashley Hall.

During the ensuing fifteen years he was Lieutenant Governor and five times (1760–61, 1764–66, 1768, 1769–71, 1773–75) governor and Commander in Chief of the Province. These were years of increasing political tension but the feeling of mutual affection and esteem between Governor Bull and his people transcended the separation of their political opinions. In 1764, when Governor Boone, between whom and the House a state of enmity and complete non-communication had existed, left the Province, "Governor William Bull his successor then addressed the Assembly and harmony was immediately reestablished between the Legislature and the Executive; the liabilities of the Province paid, and peace was established in South Carolina. But not so in England as to South Carolina's affairs."[25] The concluding sentence of the above quotation from Johnson's "Traditions of the American Revolution" is probably an accurate indication pointing to the fact that by now nothing could stem the tide of the approaching conflict with England, and the years which followed were fraught with increasing difficulties for the executives who represented the King and necessarily with anxiety and grief to the one whose home and affections were in the Province, but whose allegiance belonged to his Sovereign in England.

When, on the departure of Governor Montagu in 1773, William Bull as Lieutenant Governor assumed for the fifth time the administration of the Province, the people hoped that he would receive the full appointment as Royal Governor. They may well have felt certain of the happy results of such a step on the part of the Crown and regretted that it was not taken, knowing him to be related to leading Whigs but faithful to the King and honorable in all his transactions. "Tradition has brought down no unkind word of him."[26] When, in 1774, the zealous Council of Safety in power, a tender of the agreement as to non-importation in resistance to the Crown was taken to Governor Bull at Ashley Hall, he replied that he "wished as well to the country as anyone and heart and hand were with it but circumstanced as I am, even you gentlemen would think oddly of me were I to subscribe to it."[26]

He was not disturbed further but after thirty-five years in public service, the government having passed out of his hands with the arrival of Lord Campbell in 1775, he later went to England, where he spent some of the years until the British occupied the city in 1780. In the most difficult days of her strife, he was willing to assume the responsibility of serving South Carolina in the position of Executive, as his letters to England prove.[27] According to McCrady, "at this time, had Lieutenant Governor William Bull been sent back from England with full powers, had military rule been suspended, South Carolina might have been reconciled again, to become a province."[28] But his return was quite otherwise than with full powers. It is said that soon after his return he was borne on a stretcher, painfully ill, into the presence of Lord Rawdon to ask the life of Isaac Hayne.[29] It is well known that this request was refused; and that had the province of South Carolina not been already committed to the cause of the Revolution, the execution of Hayne would have so committed her.

William Bull had married in 1746 Hannah Beale, daughter of the Honourable Othniel Beale. They had no children. He did not escape however the experience of separated convictions which divided families at this time, his brother, brothers-in-law (the Draytons), and nephews being enlisted in the Revolutionary cause.

Of collateral descendants, only one, the great-grandson of his nephew William, became a physician; Dr. William Izard Bull (1838–1917) of Charleston, South Carolina.[6]

Political affairs had never filled the time and attention of William Bull to the exclusion of educational and scientific interests. He contributed 150 pounds to the College of Philadelphia. In 1770 he urged improvement of the public schools and the founding of a college for South

Carolina. When Governor William Henry Lyttleton returned to England, Governor Bull was elected President of the Charles Town Library Society, his election being recorded in the minutes dated July 2, 1760.[30] The pages of this interesting record after this date furnish numerous proofs of his attention to the advancement of literature and science. At the Anniversary meeting, January, 1773, he proposed the appointment of a special committee "for collecting materials for promoting the natural history of the province," this proposal being the first step taken to form the nucleus of the oldest museum in America. The Wells whose name appears among those on this committee was Robert Wells, printer and owner of the bookshop which is described by Ramsay as the only well-equipped one in the Carolinas at that time. His son was Dr. William Charles Wells, well known for his "Essay on Dew," his discussion on binocular vision, and numerous medical as well as other scientific articles.[31]

It is further recorded on this date that "the Librarian having informed the Society that the Air Pump with its appliance standing on the table was a present from the President, the motion was made by Mr. C. C. Pinckney and seconded that the thanks of the Society be given to his Honor for this fresh instance of his regard."

At the Quarterly meeting in April, 1773; "His Honor the governor proposed a genteel collection of views of the most elegant Public and Private Buildings (to be sent for, the same to be bound in boards and leather backs)," and in July, 1773; "His Honour the President presented to the Society in the name of Wm. Williamson Esq. the Head and Neck of an uncommon Bird (killed at a place called Stephens Creek in this Province)."

"Ordered that it be recommended to the select committee to take some method of preserving it in good order."

The minutes do not furnish any record of the identification of the "uncommon Bird"; but the lines which follow are of interest as they furnish evidence that books on medical subjects were received by the society: "The Librarian presented to the Society in the name of the author, Dr. Leake, a book entitled 'Practical Observations on the Childbed Fever.'"

An "Extra Meeting" in December, 1773 was ordered to be called by Lieutenant Governor Bull, "to engage an ingenious artist one Mr. Writtenhouse[32] of Philadelphia to make an Orrery for this Society, (he having made one and nearly finished another in which he seems greatly to have improved the instrument) before he should undertake for some other, or before he should go to England."

The approaching war which was to afflict the town and province and send William Bull into voluntary exile at great personal loss, now cast its shadow upon the Library Society; at the quarterly meeting in July, 1775:

> A letter from the Bookseller being read, it was ordered that the Secretary do inform him that the Society will wait for the Edition of the Journal of History of London he proposes and also that it is advised him to sell such books as he had purchased for the Society except such as can not be again purchased at an easy rate and that the Society will pay the loss he may sustain by keeping those until they shall be permitted to be imported here.

The President was absent from the meetings of the Society (which were held with remarkable regularity) after the January meeting in 1775, until April, 1778. He was present at the Anniversary meeting in January, 1780. No more meetings in the British Province of South Carolina were to occur. The next lines follow a long period of silence. "The chasm in the Journal was occasioned by the State being invaded . . . meeting of the Society was not held until the 5th of Feb. 1783."

William Bull had left with the British army in 1782. He passed the remainder of his life in London, where he died July 4, 1791, and was buried in St. Andrews, Holborn.[33]

In memoirs of this period, mention is found of a visit paid him during the last years of his life in London by a South Carolinian, Mr. James Smith.

> This gentleman when travelling in Europe . . . paid his respects to our former venerable governor William Bull. He was then in London, infirm from age but retaining a clear and discerning mind. This is the last record that we know of relative to Governor William Bull. Throughout a long life, he was remarkable for his liberality, integrity, and mercy.[34]

The phrases of his Will testify to his enduring devotion to the country of his birth.

> I, William Bull, the late Governor of South Carolina for his Britannic Majesty do . . . will my worldly goods greatly deranged and lessened in value not by my Fault but by some unexpected contingencies I have met with from peculiar situations wherein I have been placed during the late unhappy times in America . . . my plantation on Ashley River in Carolina being above 1170 acres including marsh, where my Grand Father lived, died, and lies buried, where my Father and all his children were born I wish to remain in the possession of one of his Posterity. I therefore give . . . to my nephew William Bull his heirs . . . etc. . . .

In 1792 his widow erected at Ashley Hall a monument to his memory having on one side the Bull coat-of-arms and on the other a bas relief portrait, beneath which, cut in marble, is the following inscription:

To the Memory of WILLIAM BULL
who at an early age was called to the most important offices.
In 1750 he was appointed Lt. Governor and often exercised the supreme magistracy of South Carolina with dignity and integrity
for the advantage of his country and to his own Honor:
His mind was liberal, disinterested, and noble, adorned with elegant and useful learning,
Admired in public nor less loved in social life for his amiable and blameless manners.
He conversed with animation, sense and wit, and with peculiar gentleness and complacency.
A steady friend and affectionate husband,
Long and severely afflicted with the Stone, he bare its pains with the same temper and patience he sustained a reversed Fortune.
He died July 1791
and was buried in the chancel vault of St. Andrews, London.
On this Land, part of his Estate and the place of his Birth this Obelisk was erected
sacred to his Virtues and her Grief with duty and affection by his disconsolate Widow 1792.

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ment, 1670–1719. N. Y. Macmillan, 1897, p. 121. This was the second visit of Henry Woodward to South Carolina, his first having been made four years earlier.

2. Waring, J. I. South Carolina. *J. South Carolina M. A.*, 29: 260 (Nov.) 1933.
3. Packard, F. R. History of Medicine in the United States. N. Y., Hoeber, 1931, 2: 958.
4. McCrady, E. The History of South Carolina under the Royal Government, 1719–1776. N. Y., Macmillan, 1899, p. 417. "Dr. Ramsay tells us that William Bull was the first native of South Carolina who obtained a degree in medicine; but the Octogenarian Lady who wrote the Olden Time of Carolina, herself one of the family of Landgrave Smith, mentions that Landgrave Smith's son George (Note 1), who was born in 1672, studied medicine and took his degree in Edinburgh, Scotland, in 1700, that is, thirty-four years before Dr. Bull. And in some confirmation of this, his having chosen that profession, we find the Landgrave, who died in 1694, bequeathing to his son George 'all of my instruments that belong to chirurgery, and one-half of all my medicines and one-half of all my books,' etc. From which, by the way, Mr. Landgrave himself must have been provided in a medical way. But it now appears that George Smith was not born in South Carolina, if his age is correctly given, as his father did not come into the province until 1687. We have no account of Dr. Smith's practice if indeed he did practice. In the year 1734 William Bull was graduated at Leyden, as we have before mentioned. Unless it be that George Smith was born in South Carolina, William Bull was not only the first native of South Carolina, but the first native American who received a degree of Doctor of Medicine. (Note 2.) He was a pupil of Boerhaave, one of the most celebrated physicians of his time. He defended, we are told, his thesis De Colica Pictonum before the University. He does not, however, appear to have practised his profession at all, but to have devoted himself to public affairs, in which we have already seen and shall see much more of him in the course of this history. But with his abilities, his gentle, kindly, yet firm disposition, and his remarkable tact, he must have succeeded in the practice of medicine had circumstances not called him into public life."
5. *South Carolina Hist. & Geneol. Mag.*, 1: 1, 76 (Jan.) 1900.
6. Bull, Rev. Henry deSaussure. Personal communication.
7. Dalcho, F. An Historical Account of the Protestant Episcopal Church in South Carolina. Charleston, Thayer, 1820, p. 382. Prince William Parish was separated from St. Helena Parish by Act of May 25, 1745. Commissioners Hon. William Bull, Stephen Bull, Robert Thorpe, James Deveaux, John Green. As an instance of the hospitality of the Bull family shown in connection with this Parish it is stated that Stephen Bull (born 1707) who lived in the vicinity of Sheldon Church would entertain, each Sunday, the congregation who came in sixty or seventy carriages, and would have his overseer provide for their servants.
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b. SMITH, A. R. H.[8] p. 86: "Lieut. Gov. William Bull (Senior) in 1746 conveyed to John Drayton, Esq., for a nominal consideration the back part of lot #277, bounding east on other part of said lot, 'now in possession' of Thomas Drayton, Esq., and Doctor Bull. This Dr. Bull was the second Lieut. Gov. William Bull, and the two Draytons, Thomas and John, married respectively Elizabeth and Charlotte Bull, daughters of the grantor."

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32. This refers no doubt to David Rittenhouse, one of the fourteen Americans in ante-Revolutionary times who were honored by election to the Royal Society of Great Britain.

33. Records of this Parish, quoted in a letter of Feb. 7, 1934, from the rector, Mr. Edwin S. Bedford, to the author,

show that he was buried there, the entry in the Register reading:

> "The Hon$^{\text{ble}}$ William Bull
> St. Georges Bloomsbury
> Buried 18, July 1791."

Mr. Bedford adds "I cannot explain how, living in that parish, he was buried in the parish church of Holborn." No explanation is offered of the lapse of time between the date of his death, and that of his burial recorded in the Register. A letter from the rector of S. Georges Bloomsbury states that no mention of him is found in records there.

34. Johnson, J.,[25] p. 229.

HUGH WILLIAMSON, M.D., LL.D. (1735-1819)

NORTH CAROLINA PHYSICIAN, STATESMAN, AND HISTORIAN

By E. A. HINES, JR.

ROCHESTER, MINN.

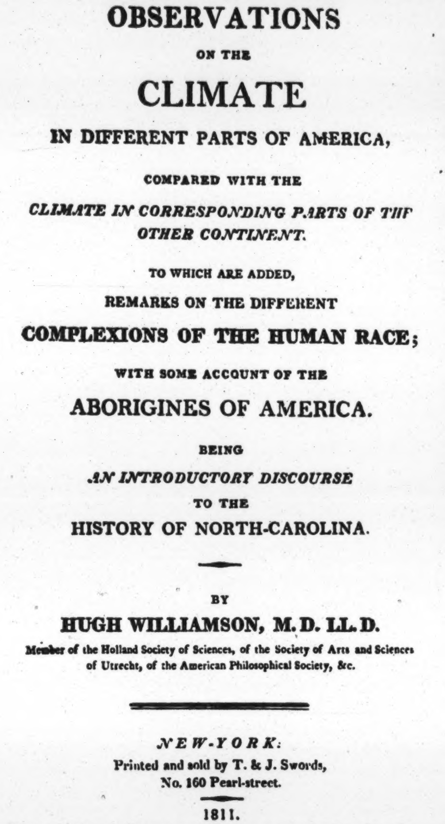
OFF the coast of Delaware one starless night, an intrepid American physician, Dr. Hugh Williamson, and his equally brave friend, slipped over the side of their captured sailing vessel and dropped into an open boat. They passed immediately beneath the guns of a nearby British man-of-war and rowed for the distant shore and safety. By this daring maneuver, Williamson avoided spending the period of the American Revolutionary War in the hold of a British prison ship, and was enabled to contribute greatly to the cause of American freedom.

Finding no medical office open for him in the army at the time, he shipped on a coast-wise vessel for Charleston, South Carolina. Here the dangers and possible profits of coast-wise trade intrigued him, and he purchased a sloop, manned it, and set out for Baltimore with a large cargo of merchandise. He put in at Edenton, North Carolina on hearing that Howe, the British general, had unexpectedly entered Chesapeake Bay. The presence of such a large British force increased the dangers of shipping; consequently, Williamson disposed of his ship and decided to settle in Edenton.

Hugh Williamson was born in Pennsylvania December 5, 1735. From his Scotch-Irish parents he inherited a combination of facetiousness, daring, integrity, and sense of moral responsibility for which he was so distinguished. His father was a well-to-do clothier. We know little of Hugh's early life except that he was the eldest of ten children and that he had a good cultural education. He was graduated from the College of Philadelphia in 1757 with an A.B. degree, and from the same institution in 1760 with an M.A. degree. Following the training received in his devout Scotch-Irish family, as well as his own inclinations, he entered the ministry; but his liberalism soon brought him into conflict with the church authorities and he turned from his first love to his second, medicine.

He sailed for Europe and started his medical studies at the famous University of Edinburgh. There he must have met Rush, Bard, Lee, McClurg and other young Americans, who were to come into prominence later in American medical and political affairs. After spending some time at Edinburgh, Williamson went to the equally famous University of Utrecht to finish his medical training, and there received his M.D. degree in 1772.

He then returned to London where he became acquainted with Benjamin Franklin and John Hunter, and with them carried out some important experiments on electricity and its relation to biological processes. These were troublesome times in London, but the young doctor did not allow his scientific interests to draw him away from what he saw to be his duty. Always a patriot, he was heart and soul with the attempts of his countrymen to alleviate the oppression of the royalists. It was Hugh Williamson who, as the mysterious "third party," secured the now famous Hutchinson and Oliver letters for Franklin.* These letters, written by Hutchinson, the last royal governor of Massachusetts, attempted to involve prominent colonists in charges of treason by painting untrue and "odious" pictures of their activities. Showing unusual daring, Williamson went boldly to one of the departments of the English sub-treasury and, assuming an air of importance and dignity demanded the letters. An inexperienced clerk, who was on duty at the time, handed them to him without question. Williamson turned the letters over to Franklin and went to Holland. As soon as news of the declaration of independence reached Holland, he returned to his country with much important information for the American cause, and soon settled at Edenton.



OBSERVATIONS
ON THE
CLIMATE
IN DIFFERENT PARTS OF AMERICA,
COMPARED WITH THE
CLIMATE IN CORRESPONDING PARTS OF THE OTHER CONTINENT.
TO WHICH ARE ADDED,
REMARKS ON THE DIFFERENT
COMPLEXIONS OF THE HUMAN RACE;
WITH SOME ACCOUNT OF THE
ABORIGINES OF AMERICA.
BEING
AN INTRODUCTORY DISCOURSE
TO THE
HISTORY OF NORTH-CAROLINA.

BY
HUGH WILLIAMSON, M.D. LL.D.
Member of the Holland Society of Sciences, of the Society of Arts and Sciences of Utrecht, of the American Philosophical Society, &c.

NEW-YORK:
Printed and sold by T. & J. Swords,
No. 160 Pearl-street.
1811.

Fig. 1. Title Page of Williamson's Book on the American Climate.

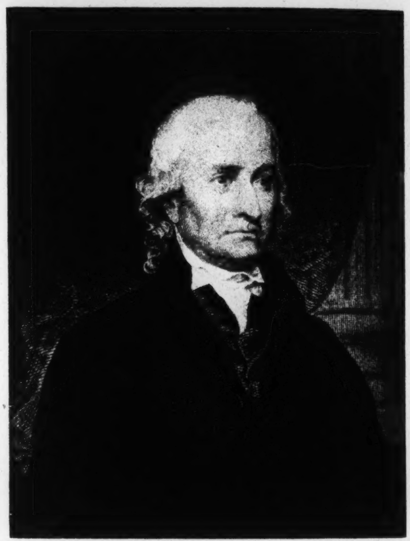


Fig. 2. Hugh Williamson, M.D., LL.D., from a Painting by John Trumbull.

With such an excellent medical training, Williamson soon became widely known around Edenton for his medical skill. In the winter of 1779 the British sent a large force into North Carolina, and a large draft of militia was put into active service to protect the state. The governor made Dr. Williamson the head of the medical department. He filled this office ably and evolved rules of sanitation which are still in use today. He experimented with diets and drew up strict rules for the disposal of sewage and for the handling of food. He even provided milk for sick soldiers at his own expense. As a consequence he made the remarkable record of losing only two of 1200 men during a period of six months.

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* Franklin loyally protected the identity of this "third party," and the answer to this important historical question was not disclosed until Hosack made it public in his "Memoirs" of Hugh Williamson some forty years later.

In 1782 politics beckoned, and he became the representative of Edenton in the House of Commons of North Carolina. In 1786 he went to Annapolis for the first constitutional convention, and later went as a delegate from North Carolina to Philadelphia where he took an important part in framing the Constitution. The many debtors in North Carolina wanted inflation and opposed the Constitution. Williamson suffered a great loss in popularity because of his support of the more conservative measures of the Constitution and, on this account, he decided to make his home in New York, where he built up a good practice and lived until the time of his death.

Well-grounded in the fundamentals of medicine, Williamson was able to write authoritative and thoroughly scientific articles on medical subjects. In 1797 he wrote an important paper on "The Fevers of North Carolina" in which he disagreed with the therapy of the Rush school and stated that he knew many patients to have been "brought to a premature grave" by too vigorous bleeding.

In the period following the American Revolution many "libelous" and untrue reports were circulated in England in an attempt to obstruct the upbuilding of the young republic. Buffon, Raynal, Robertson, and others wrote of "the inferior, disease-ridden people" and of the "unpleasant climate" in America. Such assertions made the patriotic Williamson angry, and in 1811 he published an extensive monograph "Observations on the climate in different parts of America" (Fig. 1) in which, by a multitude of facts and by conclusive reasoning, he silenced forever these criticisms.

In spite of his change of residence, there was no change of his heart toward his Carolina home for, in 1812, there appeared the two-volume "History of North Carolina." This was a result of much research while in Edenton. The work contains a short account of the discoveries made in America by adventurers and of the attempt of Sir Walter Raleigh to settle a colony in North Carolina. The narrative continues down to the Revolution. Although there is much valuable material and many documents in the two volumes, the work does not reach high historical standards. Important details and many dates are missing. It is not equal, for example, to the historical works of his neighbor, Dr. David Ramsay, physician and historian, of Charleston.

Williamson wrote much on canal navigation under the pseudonym of "Atticus." In 1814, with Governor DeWitt Clinton, he founded the Literary and Philosophical Society of New York, and also became a trustee of the College of Physicians and Surgeons of the University of New York. He became well-known as a classical scholar and philosopher. He wrote in a simple, concise, and correct style and was frequently called, "the American Cato."

In appearance he was tall, with a large frame but with thin, strong features (Fig. 2). He had a pleasing personality and was an unexcelled wit and conversationalist.

Although not a giant in the construction of the American republic, Williamson was an able statesman who contributed greatly to the stability of North Carolina during the period of the Revolution. As Dr. Hosack has said, "Whatever may be the merits of Dr. Williamson as a scholar, a physician and statesman; however, he may be distinguished for his integrity, his benevolence and moral courage," and, one might add, for his bravery and daring.

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MEDICAL WRITERS OF THIRTEENTH CENTURY ENGLAND

By J. C. RUSSELL

CHAPEL HILL, N. C.

MEDICINE, like nearly all of the fields of learning in the Middle Ages, was international in character and nearly coextensive with the Latin civilization of the Church. In this field thirteenth century England has occupied a respectable position. General histories of medicine have included Gilbertus Anglicus, Richard of Wendover, and Bernard Gordon in the list of great writers, while other men, such as Alfredus Anglicus, Guilelmus Anglicus, and Michael Scot, whose interests were primarily in other sciences, have touched medicine at particular points. The lesser writers have hardly been sorted out of the great works of bibliography nor the manuscripts searched for additional names. Into this field this article is a tentative step. It represents one part of the field of thirteenth century writers whose works and lives I have been studying as a unit.[1] It gives such information as may be discovered by a layman approaching the subject from the historical side rather than from the medical.

I

Of the little known writers upon medicine the names of three come from a single manuscript in the British Museum.[2] Two may be identified with considerable certainty with men of the first half of the thirteenth century and some conjectures are possible for the third. Master R. de Lacoc is almost certainly the Master Roger de Lacock, *medicus*, at whose instance the king of England pardoned a forest transgression in 1223.[3] In the several documents which show him a canon of Lincoln and recipient of royal favors from 1220 to 1233 he seems not to be cited again as a physician, but the one instance is enough to distinguish him from a contemporary Master Ralph of Lacock.[4] Master Th. de. Ebl. is probably Master Thomas of Ebbesborne (usually Ebleburn in the documents) who appeared consistently at Salisbury as a canon of its cathedral from 1222 to 1246. The manuscript contains recipes of a thirteenth century Philip who may be searched for in the same period near Winchester cathedral if we are to expand "ad E. Wint." to "*ad ecclesiam Wintoniensem.*"

II

Roger of Lacock was a canon of Lincoln as early as September 26, 1220;[5] his name appearing in a charter witness list ahead of several other canons. Mr. Salter has shown that in the Lincoln charters the canons were arranged by rank and then by seniority.[6] Since Roger was still a subdeacon, a member of the lowest rank, some years later,[7] the presence of his name ahead of others in the charter of 1220 probably means that he had already been a canon for some time. From that year until the nineteenth episcopal year of Bishop Hugh (1227–1228) he appears frequently as a witness of the bishop's charters.[8] The year before this, that is in 1226–1227, the bishop had given him the church of Hale,[9] and as its parson, Roger, fell into a dispute with forty-six persons, apparently his parishioners, all named in a letter patent of August 23, 1229.[10]

On August 3, 1223 Master Roger was granted eight *furchias* from a royal forest, a gift of the king.[11] In 1228 on July 11 the king gave him the church of Bruges[12] and on October 4 of the following year the church of Washingborough.[13] To this he was admitted only in 1232–1233.[14] These gifts were followed by three oaks from the forest of Chippenham and three from Melkesham for his home in Lacock in the summer of 1229, two deer, *damas*, from Sherwood forest in the autumn of 1230 and more a year later from the forests of Rockingham and Chippenham.[15]

So brilliantly begun, this career of episcopal and royal patronage did not last long. On July 21, 1233 the king granted to another the "prebend which Master Roger of Lacock had in the church of Bruges," and about the same time there is a record of another presentation to Washingborough.[16] There is a strong presumption that the gifts made to Master Roger were on account of his medical attainments and services to Bishop Hugh and King Henry III.

III

In Thomas of Ebbesborne's first appearance in the documents he is not designated as master; possibly he had not attained it by 1222, the date of the document.[17] He was present again in chapter at Salisbury in 1224, this time as a master.[18] He attended the first service in the new cathedral in 1225 and was in chapter on August 15, 1226, holding the prebend of *Rotefen* valued at viii marcs and taxed half a marc in that year.[19] He witnessed a charter of Bishop Richard on October 3, 1227 at Salisbury.[20] He was present again in chapter at about this time and in the following year consented to the election of Robert Bingham as bishop of Salisbury.[21]

Thomas attested charters of Bishop Robert in the first and second years of his episcopate.[22] He was in chapter at Salisbury on February 13, 1230 or 1231,[23] and attested a charter of Master Elias of Dereham at about the same time.[24] He was in chapter again in October 19, 1233, witnessed charters of Bishop Robert on February 17, 1236, of Roger de Stodley on January 12, 1240, and again of the bishop on November 11, 1243.[25]

In his later life Thomas seems to have become a man of wealth and a patron of churches. In 1239–40 he presented a candidate to the church of Graham.[26] Three years later he gave Colesworth Rectory to Adam de Percy and in 1245–46 presented William, a former vicar of Graham to Welby, and another man to Grantham Australis.[27] His death occurred before November 6, 1246, but probably not long before that date.[28]

Thomas's life thus is connected for many years with Salisbury. He attested an undated charter of Bishop Peter des Roches of Winchester,[29] a city with which two other medical writers seem to have been associated.[30]

IV

Philip was not among the commonest names in use in the thirteenth century so that we are justified in suggesting the name of a Master Philip of demonstrated connection with Winchester in the middle of the thirteenth century and still say probably rather than possibly. In 1245 Master Philip, rector of the church of St. Margaret, seems to have been acting for the bishop of Winchester in a suit.[31] An earlier bishop, Geoffrey at the beginning of the century, had a clerk named Philip but he seems never to be designated as a master.[32] These are the most promising hints.[33]

V

Two treatises in a thirteenth century MS at New College, Oxford, were attributed to a Master Henry of Winchester by Bernard in his catalogue of 1697.[34] Now only the second, the "Phlebotomy" has the name of an author, the title reading, "flomia Henrici." Bernard may have seen colophons which have since been clipped off or he may have had other information. Upon a second copy of the "Phlebotomy" occurs the English statement, "And of fleubotomye these thyngs sufisyn after Maister Henricus Wuntoniensis."[35]

VI

There are a few other names which may be those of medical writers of this century. A Master Hugh de Milneburne wrote a "Summa super Antidotarium Parvum."[36] Nicholas of Horsham and Edward Niger were probably later than the thirteenth century.[37] In the same MS with that of Edward is a piece by a William Stafford; several of that name can be found in the twelfth and thirteenth centuries.[38]

VII

The remaining writers, that is, the better known men, were famous either on account of their non-medical activities, their general scientific writings, or their medical works, and will be considered in that order. The writers, as their titles or preferments indicate, were practically all clerks, and those that rose naturally advanced in the Church. Hugh of Evesham became a cardinal, Nicholas of Farnham, bishop of Durham, and John of St. Giles, a famous theologian and confidant of great men. John de Cella who died as abbot of St. Albans was described by a writer of the monastery as a Priscian in grammar, an Ovid in poetry, and a Galen in medicine.[39] While an historical compilation, supposedly his, remains as a monument of his grammar, and scattered lines show his poetry, no medical work is known to exist, although this is the most highly praised of his accomplishments.[40] This abbot, *physicus preelectus et index urinarum incomparabilis* predicted his own death after seeing the condition of his own urine.[41]

VIII

The great reputation of John of St. Giles cannot be tested by examination of his written works since only one or two remain.[42] He evidently was a man of striking personality. He combined with it a dramatic flare, illustrated perhaps best by his sensational entrance into the Dominican order while preaching upon poverty at Paris probably about 1231.[43] He had been a regent in medicine at both Montpellier and Paris before this event at Paris when he was evidently interested in theology.[44] About 1233 he went to Toulouse to succeed Roland of Cremona as lecturer there.[45]

His career in England has been misunderstood because he has been confused with a contemporary John of St. Giles who became archdeacon of Oxford. The latter, however, is almost never called a master in the many documents in which his name appears.[46] Under these circumstances we are probably justified in believing that the Master John of St. Giles who was a witness of a charter of Archbishop Stephen Langton was the physician rather than the archdeacon.[47] John's high capacities were known to Bishop Robert Grosseteste (1235–1253) who asked that the friar be permitted to preach in England and later that he might be permitted to stay with the bishop for a year.[48] Shortly before the death of Grosseteste in 1253 he had a famous interview with John about the conditions of the mendicant orders.[49] He had cured the bishop of what was supposed to have been an attack of poison at one time and in 1258 he cured the Earl of Gloucester of a similar attack.[50]

John of St. Giles also found a place at the royal court shortly after his return to England. In 1235 the Emperor, Frederick II, entrusted him with a message to King Henry III concerning the pregnancy of the Empress Isabella, Henry's sister.[51] While he is stated to have been a royal counsellor in 1239,[52] he may have been employed earlier in this capacity to judge from the evidence of previous royal favors. On September 7, 1237 the sheriff of Cambridgeshire was requested to find good horses for Friar John in order that he might go to the king at York.[53] He was an executor of the will of Joan, sister of Henry III in the next year, and in 1240 was granted a favor by the king.[54]

This career of episcopal and royal patronage is somewhat typical of the possibilities open to able and politic members of the mendicant orders. In the case of John his services were made doubly valuable by his medical knowledge. The services of these orders to the unfortunate are illustrated by him in his hearing of the confession of a famous pirate, William Marsh.[55]

IX

Almost exactly contemporary with John of St. Giles was another famous physician and churchman, Nicholas of Farnham.[56] He was a friend of the chronicler, Matthew Paris, who has given some valuable information about him. Nicholas told Matthew of seeing at Paris by 1201 a miracle involving a famous professor, Simon of Tournai.[57] After studying arts at Paris he went on to Bologna to study medicine and after teaching there returned to Paris, becoming a master in theology.[58] He may be the Master Nicholas "who has for some time held a professional chair in the arts" given permission in 1218 by the pope to hold several benefices.[59] He was one of the famous Englishmen, professors at Paris, who left that city in the great dispersion of the university in 1229.[60] During this early part of his life (1216–18) he was for a time in the service of Westminster, witnessing their documents and even receiving a benefice from them, in 1219.[61] Another Westminster document, the will of Richard of Elmham, canon of St. Martin's, gives him Richard's *portebors*, that is a small portable breviary.[62] This will of 1228 calls Nicholas *medicus regis*.

The close connection of Westminster with English royalty may explain Nicholas' association with the abbey; already on August 18, 1221 he is called a royal clerk and receives twenty oaks from the forest of Brehull for repairing his house in Brehull.[63] To his physician the king gave a multitude of gifts which well illustrate the kinds of rewards which medieval royalty could bestow upon its favorites. In all these the fact that Nicholas was the king's physician was mentioned apparently but once and another item shows that Nicholas had ordered certain spices.[64] Besides the gift of timber already mentioned the physician received others in 1229 (apparently it had not come in April 1230), 1232, 1234, 1238, and 1240; some were designated for his hearth, some for his houses in Cherleton, and some for making a grange near his houses at Greenford.[65] From the woods also the physician received venison: in one instance at least he was to have men and dogs for taking them, in another, it was to be done for him. All the references to the chase occur in 1237 and 1238: was it a passing fancy on the part of Nicholas?[66] He was also given upon a few occasions tuns of wine.[67]

These gifts were supplemented by more unusual ones. Thus money was given by the king for the use of a man lying ill at Woodstock and another money gift was "for the use of the damsel whom the king proposes to make a nun at Tarent," and consisted of "60 shillings to buy clothing and to take her to Tarent and 40 shillings to make a pittance of the king's gift."[68] Several favors such as pardons were granted at Nicholas' request,[69] and Nicholas himself secured the service pertaining to land at Greenford, as well as exemption from a contribution to the Pope in 1241.[70] The king gave his physician the church of Essenden in 1222.[71] He was probably responsible for the election of the physician (who had become his confessor also) to the bishopric of Coventry and Lichfield in 1239.[72] Nicholas refused this honor but two years later at the urging of the great Bishop Grosseteste he accepted the princely bishopric of Durham.[73]

As bishop the physician seems to have inherited the troubles of his predecessors and shared in the political life of the time until he resigned with papal permission in 1249. One chronicler suggests that his resignation was forced on him because of suspicion that he had been married before his consecration. Even he believed that the bishop had redeemed himself by his humility, generosity, and piety.[74] Faith in the saints ran high then: in 1244 he was miraculously cured through the agency of some hairs from the head of St. Edmund.[75] He died in 1257.

X

Like both of the preceding writers there remains little of the literary production of Hugh of Evesham: in fact only one bit, a sermon has thus far been identified.[76] But that his reputation was one to conjure with is clear from the following paragraph quoted from a recent publication:[77]

> A few years afterward, Nicholas III (Giovanni Gartani Orsini, 1277–1280) and Martin IV (Simon de Brie, 1281–85) commissioned Hugh of Evesham (Atratus) to find a cure for the "fever" which wrought such havoc in the city. While in Orvieto, Martin IV created this philosopher and student of medicine (his personal physician) cardinal of San Lorenzo in Lucina. Rome owes to Hugh the rebuilding of this church and of other buildings on what is the Corso, but not the liberation from her greatest scourge, the malaria. The learned man himself died of the fever while pursuing his researches (1280).[78]

Hugh first appears as a witness of a confirmation of a charter on October 12, 1265 without the title master.[79] This circumstance might be a cause of doubt about identification except that he appears among men and in conditions familiar in his later life:

the document was executed by Archbishop Walter of York, and the name of Sir (dominus) Richard de Middleton appears also in the document. In 1269 he was a master at Oxford, acting as one of five who were endeavoring to settle a quarrel over poverty between the Franciscans and the Dominicans which was disturbing the university at the time. His speech is recorded in an account of the dispute, and he seems to have been a spokesman for the group.[80] In 1272 between April 2 and August 18 he was presented to the church of Hemingburgh by the prior and convent of Durham upon the death of Sir Richard Middleton,[81] resigning at the same time the church of Welton to no less a person than Robert Burnell, the great legal advisor to King Edward I. In 1279 he was a canon of York and received a vote for the position of archbishop of York.[82] He was directed by a letter of December 17, 1279 to examine candidates for ordination.[83] In this same year he seems to have exchanged his prebend at York for the prebend of Begthorp.[84] He apparently held the church of Spofford at this time since it was void by reason of his death some years later.[85]

Hugh's connections with the royal favorites, the archbishop of York and Robert Burnell, prevents one from being surprised that he was in favor at the king's court. In 1272 at his request Geoffrey de Ullingham was allowed exemption for life from attending county and other local courts.[86] As a royal clerk in 1275 who is stated to have served the king and his mother for a long time he was excused from paying a debt to Fountains Abbey.[87] In 1278 he was given four bucks of the king's gift from the forest of Galtres.[88] He probably owed to the king the archdeaconry of Worcester which he seems to have held from 1275 until his death.[89]

Now the last phase of Hugh of Evesham's life began with a letter of appointment, dated 10 September, 1280, to the Papal Curia.[90] His coming to Rome was quickly followed by his appointment as cardinal priest of St. Lawrence on March 23, 1281,[91] an appointment in which Hugh's medical attainments were possibly a determining factor. He remained in close contact with his English friends at York and at the royal court. The archbishop sent him a letter of congratulation, begging him not to overwork himself and cautioning him against poison.[92] He also had frequent occasion to call upon the cardinal for assistance at the Curia.[93] Edward I reckoned him among his friends at Rome whose help was needed to expedite some negotiations in 1284.[94] Hugh reciprocated by requesting favors for his nephew, his chaplain, and Robert de Byzel, condemned for robbery, receiving robbers, and association with a hanged man.[95] He died in 1287.

XI

Three famous scientists were interested either in medicine or in subjects closely related to it. Alfredus Anglicus or Alfred de Sarechel wrote a book upon the heart and also some commentaries upon the "Parva Naturalia." He is probably the Master Alfred whose presence at Hereford at the end of the twelfth century is shown by several sources.[96] William the Englishman, a physician at Marseilles, interested primarily in astronomy wrote a treatise "De Urina non Visa," probably more of interest for magic than for medicine.[97] The third, Michael Scot, reported the result of a clinical observation: he was, however, an astrologer and translator.[98] The careers of these men while important for the introduction of Arabic learning into the Latin West touch medicine only lightly.[99]

XII

England can lay claim to three great medical writers of the thirteenth century and possibly to a fourth, Walter Aguilon.[100] Bernard Gordon, by carefully dating a number of his writings and adding other data has enabled Karl Sudhoff to fix his life with some degree of accuracy. He seems to have started lecturing at Montpellier about 1283, writing books at short intervals from 1294 until 1307 at least.[101] A colophon of a treatise of 1303 called him dean of the doctors. He probably spent his life at Montpellier after completing his study there. The other two writers, Richard and Gilbert, seem to have spent part of their lives in England although as their names Richard Anglicus and Gilbertus Anglicus show that they had an international reputation. About both men there are still many problems to be solved. Richard was a common name, and the treatises of Richard of Wendover have yet to be separated from others of the same given name. Even the combination Richard of Wendover was shared by a contemporary bishop of Rochester. The name Gilbert was quite uncommon: were it not for questions of chronology it would be easy to identify him with an interesting Master Gilbert de Aquila whom we shall discuss later.

For Richard of Wendover we may start with a statement of Matthew Paris:[102]

> At about the same time (June 6, 1252) Master Richard of Wendover, canon of St. Paul and distinguished physician, died. He provided prayers for himself much more circumspectly than the aforesaid Robert (Passelewe). He provided for nine priests who should say mass forever for his own soul and those of all the faithful each day. We ought to mention him specially in this book because he gave a certain cross to the church of St. Albans in which there are many relics although their certificates of authenticity have been doubted. This cross, which was of ivory, was very dear to Pope Gregory. And since the aforesaid Master R. was his physician, the pope when about to die ordered this cross most dear to him to be given to the man most dear to him.

This account enables us to identify the physician with the canon of St. Paul's, which otherwise, as we shall see, would be difficult to do. Nearly all the English documents about Richard are concerned either with his duties as canon of St. Paul's or with his provision for the nine chantries. However, his professional duties may have been connected with the great St. Bartholomew's Hospital. He witnessed one of their charters in July, 1242 and about 1250 he became a member of their fraternity when the prior and convent acknowledged

> . . . the receipt of a psalter and a gloss, in two volumes, and of the Epistles of St. Paul and of an altar (mensa) and linen cloth (mensale) from Master Richard of Wendover, and receive him into their fraternity.[103]

As early as 1233 Richard witnessed a charter of St. Paul's.[104] He witnessed others in 1241, 1243, and 1244,[105] and probably in 1237.[106] In 1239 St. Paul's gave him a manor which may have been the cause for being distrained for a forest offense, for which offense or some other he was given respite.[107] His prebends are not beyond doubt: he is supposed to have held Ealdland, Rugmere, and Neasden, all of the diocese of London.[108] Had not Matthew Paris informed us that Richard was with Pope Gregory IX near the time of his death in 1241, his witnessing of documents in that year would have created a presumption against it. To him King Henry III gave four oaks from one of his forests for successful professional services to Fulk of Newcastle.[109]

Of the nine chantries at least one was, as we might expect, established at St. Paul's. His death apparently occurred on March 5, 1252; on this day annually a liberal gift from Richard's endowment was given to the clerks of the choir, paupers and to the church fund for upkeep of the fabric of the cathedral.[110] A mass was to be said for him daily at the altar of St. Hippolitus.[111] To provide for these he had apparently given houses whose annual income was nine marcs a year.[112] He established another chantry at the monastery of Lavendon, Bucks on Christmas Day, 1250, a third at *Trembale*, and a fourth at Holy Trinity, London, giving the prior and convent thirty marks.[113] We may suspect that a fifth was at St. Bartholomew's, but of the others evidence is wanting. It is interesting to note that the will of Walter of Suffield, bishop of Norwich, of May 20, 1257 left twenty marks to the poor of the diocese of Norwich for the soul of Richard of Wendover, his companion.[114]

XIII

Two medical works of Gilbertus Anglicus had a wide circulation in the Middle Ages: his "Compendium" and a commentary upon the "De Urinis" of Giles of Corbeil, physician to Philip Augustus of France (1180–1223).[115] To fix his date we must start with these works. Gilbert comments upon the work of a certain Richard whose identity is not yet established and upon Averroes who died in 1198. As Handerson observed, Gilbert probably read his work in translation, the earliest of which were by Michael Scot about 1220–1236. He believed also that the surgical sections of the "Compendium" came largely from the "Rogerina" written about 1230. Yet the "Compendium" is frankly a compilation in which Gilbert usually gives his authorities; his failure to give Roger credit arouses some suspicion that he was not copying from a book. Both may have heard the same surgical lectures or one may have heard the lectures of the other. The date before which is easier; the "Compendium" is quoted in the "Thesaurus Pauperum" of 1270 and by Theodoris, bishop of Cervia about 1266.[116] These indications point to the first half of the thirteenth century, but they are at best very shaky as to the time after which.

Of the career of Gilbertus Anglicus as student or teacher little may be hazarded. From his works it is obvious that he had a high regard for the *Magistri Salernitani* and may well have studied there. A Rue Gilbert Langlois near the medical quarter of Paris rather suggests that he may have taught there. There was apparently about 1250 a chancellor of Montpellier of the name Gilbert. For centuries a controversy has existed as to whether this physician was Gilbert de Aquila or not. The identification was apparently first made by Bale upon the basis of the story of the death of Archbishop Hubert Walter as chronicled by Ralph of Coggeshale:[117]

> Upon a journey from Canterbury to Boxley with a considerable following where he was to reconcile the rebellious monks of Rochester with their bishop upon an appointed day the venerable archbishop (of Canterbury) Hubert Walter was stricken with a high fever and virulent ulcer so that he turned aside to one of his manors, Tenham by name, and there after four days on July 13 (1205) his life ended. The ulcer in the third from the last vertebra, which he had been too modest to show to his attendants, had erupted to such an extent that the inflamed portion seemed to approach his private parts.
>
> To avert the serious danger of this kind of ulcer one thing may be tried. If the patient, however, feels a stitch between the breasts or raises a sweat he knows that death approaches. He may be cured from such an ulcer by a mixture of equal quantities of raw yolk of egg and salt if it is applied as a poultice on the affected place and frequently renewed. Let the patient eat bread and water until the matter be destroyed. Bloodletting should be avoided unless the matter be drawn into a receptacle.
>
> If the archbishop had reported his affliction sooner, he would have been cured without doubt, the physicians asserted. Advised by Master Gilbert del Egle that on account of the danger of the septic matter and fever he ought to be reconciled to his Creator . . .

he confessed amid a torrent of tears.

> After doing these things, going to the table he comforted the failing nature of his feeble body with a very little food and a drink of warm water, and was then advised by the aforesaid G. to make his will.

He proudly replied that he had done this seven years before, renewing it each year; and now had it done again.

> On the third day, that is July 12, the aforesaid G. at daybreak seeing with the secret eye of his mind suggested that Hubert be given the extreme unction. He acquiesced freely, asking, however, a delay until the arrival of the venerable bishop of Rochester. Arriving about the third hour (before nine A.M.) the bishop wished to anoint him, but the archbishop comforted by a certain physician, Hendrik de Afaite, wished to postpone it until the next day. He said that it would be more honorable to be anointed before breakfast than after.
>
> About the ninth hour (after three P.M.) the septic matter went to the head and for a time he was delirious. But the force of the disease was retarded by physical remedies; that is, by administering warm vinegar to his head and rubbing his feet with vinegar and salt, and he returned to consciousness, asking devotedly for the extreme unction.

After extreme unction at about the time of vespers he sang a psalm, prayed and blessed his followers. Then he ate a little and was quiet until midnight.

> Then there swept over him great feebleness; his panting body consumed in a furnace of fevers, the devouring fire burned out gradually the strength of the suffering body. He lay there overheated, racked by continuous and deep gasps, and worn out by too rapid breathing: all promised that the soul was ready to migrate from its home in the flesh.

The story of the presence of these two physicians at the deathbed of the archbishop is confirmed in a curious fashion; a charter of the archbishop enrolled in an ancient cartulary contains three witnesses, Master Gilbert de Aquila, Hendricus de Afaite and a third doctor, Master Jordanus Physicus.[118] Both the second and third names seem more foreign than English. Brought in especially to care for the archbishop, they were probably men of repute in the medical world. Yet Gilbert appears in the charter ahead of both of them and in the account would seem to be in charge. Evidently he was no ordinary physician. This Master Gilbert de Aquila appears in other contemporary records. On January 26, 1205 by a charter witnessed by Archbishop Hubert, Gilbert was to receive the hundred shillings given by the Earl of Leicester for his homage and service to the king.[119] On March 3, 1207 the king ordered letters of presentation to the church of Stithed to be given Gilbert; this donation was in the vacant archbishopric of Canterbury.[120] In the same year Gilbert gave the king sixty marks for holding the manor of *Chertham* in Kent for an annual farm of forty pounds. A group of prominent men went surety for him, Robert de Vipont, Thomas Basset, Master Matthew Medicus, William de Cantelupe, Humphrey, archdeacon of Salisbury, and Richard Marsh.[121] Then on April 16 of the following year the king ordered Reginald of Cornhill to assist Gilbert in paying off the debt thus incurred.[122]

The name Gilbert de Aquila was an ancient and venerable one in England. One man of the name died in 1204 and was succeeded by another of apparently the same name, but neither was a master, to judge from the very numerous documents in which their names appear. There was a Gilbert de Aquila, a *parmentarius* of London who appears in the documents of Westminster Abbey.[123] It is quite likely that our physician was related to either family. There are a few other references to one or more named Gilbertus Medicus but nothing about the citations to suggest importance.[124] There is considerable probability that the physician who attended Hubert Walter was the famous medical writer.

The impression produced by a study of these men is that they were a well-paid, highly respected group. Were they rewarded for their professional services or for other activities? It is difficult to decide this question with the evidence at hand, but, at least, it can be said that the highest ecclesiastical positions were open to physicians. Hugh of Evesham became a cardinal, evidently because of his medical ability, and we may suspect that the wealth of Thomas of Ebbesborne, Richard of Wendover, and Gilbert de Aquila came the same way. We learn also that in documents of the time there is no attempt made to distinguish the masters of medicine from the masters of other disciplines. In several cases only chance references enable us to label our men as physicians. These writers are in general men of broad education, frequently conversant with theology as well as medicine. They were products of a system which encouraged men to hear the lectures of professors of many subjects. A warning is necessary against using the careers of these men as typical of the general run of doctors of medicine. They were probably the greatest physicians of the time; otherwise they would have hardly enjoyed the patronage of kings and bishops. This study has not touched upon the content of medical writing: that must await the careful examination of medical manuscripts to fix more accurately than at present the lists of writings of particular physicians.

References

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3. Rot. Litt. Claus., i: 580.
4. Calendar of Patent Rolls, 1225–32, 356; *ibid.*, 1232–47, 270, 278.
5. Oxford, Bodleian Library, MS *Laud, Misc.* 642, fol. 4v.
6. Rotuli Hugonis de Welles, p. xvi.
7. *Ibid.*, III: 162 (1226–1227).
8. *Ibid.*, II: 97 (2), 200 (2), 202, 203 (2), 204, 205, 206, 210 (2), 213–216, 221, 222, 226; British Mus., Roy. MS, 11 B ix, fol. 30v; H. E. Salter, ed. The Boarstall Cartulary, Oxford, 1930, 7; Cambridge University Library, *Add.* MS. 3020, fol. 73r; W. R. Jones and W. Dunn, eds. Charter and Documents, etc. of Salisbury, London, 1891, Rolls ser., 122.
9. Rot. Hugonis de Welles, III: 162.
10. Calendar of Patent Rolls, 1225–1232, 303.
11. Rot. Litt. Claus. I: 557.
12. Calendar of Close Rolls, 1227–1231, 61.
13. Calendar of Patent Rolls, 1225–1232, 271.
14. Rot. Hugonis de Welles, III: 171.
15. Cal. of Close Rolls, 1227–1231, 187, *ibid.* 459, *ibid.*, 1231–1234, 2.
16. Cal. of Patent Rolls, 1232–1247, 21; Rot. Hugonis de Welles, III: 207.
17. Rich Jones, W. H. ed. The Register of S. Osmund. London, 1884, Rolls ser., I: 338.
18. *Ibid.*, II: 22.
19. *Ibid.*, II: 38, 60, 73.
20. Jones, Macray, eds. Charters and Documents etc. of Salisbury. London, 1891, Rolls ser., 189.
21. Reg. of S. Osmund, I: 319: II: 109.
22. Dugdale. Monasticon Anglicanum. VI: 503, 12 kal. May; Brit. Mus., MS Cotton, Claud. C, IX, fol. 184v: vii dies Aug.
23. Reg. of S. Osmund, I: 388.
24. Charters and Documents, etc. 205.
25. *Ibid.*, 229, 237–8, 254, 289.
26. Rotuli Grosseteste, 43. He is here given the title subdeacon of Salisbury but this may be a mistake for another canon, Thomas of Chobham. Ebbesborne held Graham shortly before his death. Calendar of Patent Rolls, 1232–1247, 494.
27. Rot. Grosseteste, 64, 83, 89.
28. Cal. of Patent Rolls, 1232–1247, 492, 494.
29. Brit. Mus., MS Cotton, Vesp. F xv.
30. In the British Museum is a Physionomia Thome Anglici in MS Add. 15107, fols. 43v–44v, beginning "Diverse membrorum dispositiones" and ending "cordis iudicium." A Muster Thomas Medicus attested a charter of J. prior of Spalding. Brit. Mus., MS Add. 5844, fol. 219.
31. Brit. Mus., MS Stowe 942, fol. 5r.
32. Brit. Mus., Add. MS 29436, fol. 31r; MS Egerton 2104a, fol. 200r; Chartulary of Winchester Cathedral, ed. Goodman, Winchester, 1927, 6, 7, 41.
33. A Master Philip of Eton appears as a writer in MS 177 of the Corpus Christi College Library, and a Master Philip Medicus witnessed a charter of Hugh of Clive. Brit. Mus., MS Cotton, Otho A ii, fol. 14v–15r.
34. Catalogi Librorum Manuscriptorum, etc. Oxford, 1697, 35, "Medicinales questiones Magistri Henrici de Wynton super Isagogen Joanitii," and "Liber Phlebotomie Magistri Hen. de Wynton." MS New College, 171, fols. 1r, and 74r.
35. Cambridge, Gonvile and Caius Coll. MS 176, fols. 1–11.
36. Brit. Mus., MS Add. 8092, fol. 25v, which begins, "Testante Constantino humana corpora."
37. Although the Worcester Cathedral MS (Q 60) of Nicholas' "Antidotarium" is said by the catalogue to be of the thirteenth century. Edward's *practica* is in Royal MS 12 G iv of the British Museum.
38. An archdeacon of Madrid of the name witnessed a Toledo charter of 1154.

Haskins: Studies in the History of Medieval Science, 127. In 1240–41 another, a master, resigned the rectory of Marcham-le-Feu, and was probably the same as the official of the archdeacon of Lincoln eight years later. Rot. Grosseteste, 52, 107, 109. About this time a William de Stafford was canon, possibly prior of Derbey. Brit. Mus., ms Cotton, Titus C ix, fols. 39v, 40r. At the end of the century there was a William de Stafford, official of the diocese of Coventry and Lichfield. Reg. Winchelsey, p. 59.

39. Gesta Abbatum Monasterii S. Albani, ed. H. T. Riley, London, 1867, Rolls ser., i: 217, cf. also p. 246.

40. Oxford, Bodleian Library, ms Douce ccvii (middle 13th cent.) of the chronicle of Roger of Wendover has in early hands on each side of the text at the end of the events of 1188: "Huc usque in lib. cronic. Johannis abbatis," and "Usque hoc cronica Johannis et hic finis." The compilation was used by both Roger of Wendover and Matthew Paris. For John's poetry see the Gesta (cited above), i: 244, 247.

41. Gesta, i: 246.

42. "Experimenta magistri Johannis de Sancto Egidio," Oxford, ms Bodley 786, fol. 170r–171v. Cf. also Haureau, "Notices et extraits de quelques mss de Paris," iv: 236.

43. Paris, Matthew. Chronica Majora, v: 400–401; Quetif et Echard, Scriptores Ordinis Praedicatoris, i: 100; Trivet, Annales, ed. Hog, 211.

44. Trivet, *loc. cit.* He is listed among the Dominicans of England who were licensed by the chancellor of the University of Paris in theology before 1258. Denifle, H. Quellen zur Gelehrtengeschichte des Predigeordens. *Arch. f. Litt. u. Kirch. Ges. d. Mittelalt.*, 2: 171, 1886.

45. *Ibid.*, 174.

46. An exception is in ms Harley 3688, fol. 137v, of the British Museum.

47. London, Lambeth Palace, ms 241, fols. 184r, 225r. No date given but it preceded the death of the archbishop in 1228.

48. Luard, H. R. ed. Roberti Grosseteste Episcopi quondam Lincolniensis Epistole. London, 1861, Rolls ser., 60, 61, 62, 132.

49. Paris, Matthew. Chronica Majora. v: 400–1.

50. *Ibid.*, v: 705.

51. *Ibid.*, iii: 324.

52. *Ibid.*, iii: 627.

53. Calendar of Liberate Rolls, 1226–1241, 291.

54. *Ibid.*, 318; Calendar of Patent Rolls, 1232–1247, 214; Cal. of Close Rolls, 1237–1242, 215.

55. Paris, Matthew. Chronica Majora. iv: 196.

56. For his writings see Dictionary of National Biography under his name.

57. Chronica Majora. ii: 476.

58. *Ibid.*, iv: 86.

59. Bliss. i: 55.

60. Chronica Majora. iii: 168.

61. Muniments of Westminster Abbey, nos. 16739 (of 1217), 32628, 22493, 1846, and 2017: Domesday of Westminster, fols. 447r, 306r, 575v and 336r: Rotuli Hugonis de Welles, i: 137; iii: 44.

62. Muniments, no. 13262.

63. Rot. Litt. Claus, i: 468b; i: 532, a similar gift in January, 1223.

64. Calendar of Close Rolls, 1234–1237, 145: Rot. Litt. Claus, i: 532.

65. Cal. of Close Rolls, 1227–1231, 265, 287, 316; *ibid.*, 1231–1234, 72, 411; *ibid.*, 1237–1242, 81, 205.

66. *Ibid.*, 1234–37, 496; *ibid.*, 1237–1242, 5, 84.

67. *Ibid.*, 109, 205; Cal. of Liberate Rolls, 1226–1240, 481, 33. Cal. of Close Rolls, 1237–1242, 109, 205.

68. *Ibid.*, 399, 374.

69. Calendar of Patent Rolls, 1225–32, 106: *ibid.*, 1216–25, 379; when he witnessed a royal charter at Gloucester; Cal. of Close Rolls, 1234–37, 56, 507.

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71. Cal. of Patent Rolls, 1216–25, 328.

72. Annales monastici, iii: 144.

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83. *Ibid.*, 22.
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85. Calendar of Patent Rolls, 1281–1292, 327.
86. *Ibid.*, 1266–1272, 648, 653.
87. Cal. of Close Rolls, 1272–29, 158. The Hugh who was physician to Edward about a score of years earlier seems to have been Hugh de Insula. Calendar of Close Rolls, 1253–54, 274; *ibid.*, 1254–56, 282.
88. *Ibid.*, 1272–79, 478. Also an item of 1276. Rigg, J. M. ed. Calendar of the Plea Rolls of the Exchequer of the Jews. N. Y., 1905, iii: 135.
89. Bond, J. W. Willis ed. Register of Bishop Geoffrey Giffard. Oxford, 1902, 58. This archdeaconry was held occasionally by royal clerks. Geoffrey was the brother of the archbishop of York.
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91. *Ibid.*, 194.
92. *Ibid.*, 194.
93. *Ibid.*, 195, 197, 200, 202, 204, 205.
94. Calendar of Chancery Warrants, i: 19.
95. Calendar of Patent Rolls, 1281–92, 135, 84, 86, 160.
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97. For William see Duhem, P. Le Système du Monde. Paris, 1915, iii: 287–291; Thorndike, L. A History of Magic and Experimental Science. N. Y., 1923, ii: 477–487.
98. For him see Haskins, C. H. Studies in the History of Mediaeval Science. Cambridge, 1927, chs. xii and xiii: also his Michael Scot in Spain. *Homenaje a Bonilla Y San Martin*, Madrid, 1930.
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103. Moore, N. The History of St. Bartholomew's Hospital. London, 1918, 382.
104. Hist. mss Commission ix Report, Appendix p. 28b, nos. 1058, 1060.
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111. *Ibid.*, fol. 90v.
112. *Ibid.*, fol. 96r: Hist. mss Commission, iv Report, Appendix, 161.
113. Hist. mss. Comm. ix Report, Appendix, 56b, 33b, 27b (Ch. A-25-1750.)
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115. H. E. Handerson in his Gilbertus Anglicus, Cleveland, 1918, has given long and interesting quotations from the former.
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118. Cambridge University Library, MS Ll ii 15, fol. 7r.
119. Rot. Chartarum, 141.
120. Rot. Litt. Pat. 59b.
121. Rot. de Finibus, see index.
122. Rot. Litt. Claus. I: 112.
123. Westminster Muniments, nos. 13418, 13426: Domesday fol. 560r.
124. Master Gilbertus Medicus, Chancellor's Roll, 3 John, p. 4: Master Gilbertus medicus de burch, Cambridge University Library, MS 3020, fol. 79r: Master Gilbert and son Peter, STENTON, D. M. ed. The Earliest Northamptonshire Assise Rolls 1202–3, Lincoln, 1930, 73: Pipe Roll, 14 Henry III, 205. Peter seems to have held lands in Warwick and Leicester and died in 30 Henry III (1245–46). Public Record Office Memoranda Roll 18 m 1.

JOHN LOCKE*

By EDGAR A. SINGER, JR.

PHILADELPHIA

WHEN a section of the College of Physicians does a philosopher the honor to ask him to speak of a colleague of their own, knowing this colleague to have been but a vague figure in medicine, an historic one in philosophy, the guest can only suppose two things to have been expected of him. First, that he should recall the circumstances under which so good a mind was lost to medicine; second, that he should estimate the measure to which medicine's ancient loss proved science's ultimate gain. Let me then take these matters up in the order of their mention.

In the days when Sydenham was still fighting for his ideas on the treatment of disease in general, of fevers in particular, of smallpox most especially, we find him writing to Robert Boyle a letter, half confident, half protesting:

> I have the happiness of curing my patients, at least, of having it said of me that very few miscarry under me; but cannot brag of my correspondency with some of my faculty, who impeach me of great insufficiency; though yet, in taking fire at my attempts to reduce practice to a greater easiness and plainness, and in the meantime letting the mountebank at Charing Cross pass unrailed at, they contradict themselves, and would make the world believe I may prove more considerable than they would have me.†

This letter is of the year 1668, two years subsequent to the first edition of the "Methodus curandi febres." It is well known how little indeed the work and its author could brag of their correspondency with the medical opinion of their time; yet there was evidently *one* who had been prompt to recognize a new master. This one must shortly after the appearance of the "Methodus curandi" have sought the acquaintance of its author; and what is more, must so have recommended himself to the confidence of Sydenham as to be accepted by this rather cautious personality as the companion of his rounds, and the observer of his practice. In return, we find this sagacious admirer and sympathizer to have been diligent in calling the attention of the thoughtful men of his day to Sydenham's new teaching and therapy, for the letter to Boyle continues, "I perceive my friend Mr. Locke hath troubled you with an account of my practice, as he hath done himself in visiting with me very many of my variolous patients especially." Eight years later, Sydenham's method of treatment had evidently made some progress toward professional recognition, for in that year, 1776, wherein appeared the "Observationes medicae," the University of Cambridge conferred upon its author the doctorate in medicine. Yet the new "Methodus curandi" must still have had its way to make with the more conservative of the profession; for neither at this time nor later did the London College of Physicians bestow on Sydenham any rank higher than the licentiate accorded him in 1663. We may judge then how greatly, while the "Observationes" were still in preparation, the ideas of the innovating physician must have stood in need of friends whose opinion should have weight with men of weight. This makes it the more significant that a physcian of the order of Sydenham, dedicating his new work to a physician of the prominence of Mapletoft, should have thought it particularly worth while to cite on behalf of his methods the sanction of a name which at that time could have had no weight with medical men, save the weight of its medical reputation. Yet we find Sydenham writing in his dedicatory epistle to Mapletoft:

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† Fox Bourne, H. R. Life of John Locke. 1876, 1: 219.

* Read by invitation before the Section on Medical History of the College of Physicians, Philadelphia, January 9, 1933.

> You know how thoroughly my method is approved of by an intimate and common friend of ours, and one who has closely and exhaustively examined the subject—I mean Mr. John Locke, a man whom, in the acuteness of his intellect, in the steadiness of his judgment, and in the simplicity, that is, in the excellence of his manners, I confidently declare to have among the men of our own time few equals and no superior.*

The John Locke whom we see in '68 accompanying Sydenham on his rounds is a man of thirty-six; this "intimate and common friend" of Sydenham and Mapletoft, to whom in '76 we hear such admiring reference, will be a man of forty-four. One would naturally suppose the eager student of medicine who at thirty-six had at once recognized and followed a new master of his science must at forty-four, to have been so admired by this master, have established in the intervening years an enviable record of his own. How else should the best medical mind of its day have come to cite to one of the most influential practitioners of that day the approval of John Locke, as an opinion supporting in an important way a new medical theory and therapy?

But one would be disappointed; the reputation of Locke in his medical capacity was then, and always remained, confined to a few; the medical mind Sydenham had so much admired, came more and more to limit its practice to the service of friends. One reason for this abandoning of a career that had evidently been seriously planned and carefully prepared for, is, if not exactly to be established, yet confidently to be surmised from the documents at our disposal. At the moment of the appearance of the "Observationes medicae," whose dedicatory letter contains Sydenham's reference to Locke, the unfortunate subject of so much and such sincere praise was not in England at all, but at Montpellier in southern France. There was, to be sure, a famous medical school at Montpellier, the very one in fact at which Sydenham himself had studied; but it was not to perfect his science that our physician had sought Montpellier. Locke had been ordered South. What more need be said? What life remained for his later years save that which he actually led?—the life of a private gentleman of some little inherited property, enjoying for many years a medical studentship at Christ Church; family physician, friend, counselor, occasional tutor of three generations of the Earls of Shaftsbury; known to his friends as a very present help in time of trouble;

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* *Ibid.*, 1: 219.

known to country and King as a sound adviser in matters of state; but known to posterity only as the author of an essay. But then to have been the author of "The Essay concerning Human Understanding," is to have been the author of one's own immortality; had it not been for John Locke the essayist, few indeed of this day would have so much as heard of John Locke, physician, B. M. Oxon., 1673.

It is then hardly worth your while that I should spend more of this brief hour we have together on the history of a physician whom a cough doomed to obscurity, when I may tell the much more interesting story of a philosopher whom a quietly competent brain raised to authority. Fortunately, none who would care to know intimately and well the other deeds and the other man of this author of an Essay, need be at pains to satisfy themselves: the first biography of Locke, by his cousin of a later generation, Lord King, 1829, though rich in family materials, leaves much to be desired; but the two-volume "Life of John Locke," by H. R. Fox Bourne, 1876, is a masterpiece of thoroughness not without literary ease. And, as it seems to me, one who will give himself the trouble to turn the pages of Fox Bourne, or even of the later and more compact Fowler, may count on being repaid by the addition to his acquaintanceship of one whom none knew save to admire, none knew well save to love. Perhaps too at the end of his reading, the student of Locke's life will not be inclined to disagree with me on a speculative point that has occurred to me on perusing these same pages. At any rate, let me lay the matter before you, if only by way of transition to others of more serious interest.

Nothing more is involved than a comparison of three documents, of which the first will be Sydenham's "Methodus curandi." From this, it is not hard to make out the quality of Sydenham which above all others appealed to the temper of Locke; it was this physician's insistence on one unfailing principle of his science, obvious in our day, almost unobserved in his. Not but that Sydenham, like others who had gone before, was indebted to ancient sources for the first suggestion of his method: he was never tired of making his acknowledgments to the Father of Medicine, Hippocrates, whose fundamental idea he sums up in one sentence of his "Methodus": "He (Hippocrates) found that nature alone often terminates diseases, and works a cure with a few simple medicines, and often enough with no medicines at all." But what then? To what an active life must this bare suggestion of early times drive the practitioner of any time, who would seek to profit by it! Nature, alas, has published no work on her method of curing diseases; only her works are public, and only by the closest spying on these can one hope to force her occasional cures to reveal her rule of cure. To be sure, no more is needed than to discover what accidents of a patient's condition are unfavorable to nature's benign operation, but how discover that? Sydenham's answer is the only one that would occur to the science of our day; it was a hard saying to the deductive medicine of his day: "That practice," Sydenham writes, "and that alone will bring relief to the sufferer, which elicits the curative indications from the phenomena of diseases themselves, and confirms them by experience." And "if only," he adds, "one person in every age had accurately described and constantly cured but a single disease, and made known his secret, physic would not be where it is now."*

Well, all that is a matter and document perfectly well known to this company. But now let me lay beside it another. At about the same time these words were being written by Sydenham, John Locke, then in full hopes of becoming a physician, was evidently designing an ambitious work "De arte medica," of which no more was ever completed than a few introductory pages. These, as it happens, have been preserved among the Shaftsbury papers; let me quote a certain brief passage that purports to account for the low estate into which medicine had fallen, and to suggest the way to a cure. Locke here contends:

> The beginning and improvement of human arts, and the assistance of human life, have all sprung from industry and observation. True knowledge grew first in the world by experience and rational operations, and, had this method been continued, and all men's thoughts been employed to add their own trials to the observations of others, no question physic, as well as many other arts, had been in far better condition than now it is; but proud man, not content with the knowledge he was capable of and was useful to him, would needs . . . lay down principles and establish maxims to himself about the operations of nature, and then vainly expect nature, or in truth God himself, should proceed according to those laws his maxims had prescribed for him. . . . [Meanwhile] those who had read and writ whole volumes on generation and corruption knew not the way to preserve or propagate the meanest species of creatures; he that could dispute learnedly of nutrition, concoction and assimilation, was beholding yet to the cook and the good housewife for a wholesome and savory meal; and whoever desires to have fair gardens and fruitful fields had more reason to consult the experience of the dull ploughman and unread gardener than the profound philosopher or acute disputant.*

Recalling the passage previously quoted from the "Methodus curandi," no doubt you will feel with me that these two minds are in such perfect accord that Sydenham as well as Locke could have written this paragraph of the "Ars medica." He *could* have, but the point is, it would never have occurred to him to do so. At this time, the minds of the two men match wherever they meet, but they will not long continue to meet. Two temperaments are beginning to diverge; Sydenham will continue to apply a principle of empirical philosophy to the science that alone interests him, the science of medicine; Locke will soon expand a principle of empirical medicine into a science that more and more absorbs him, the science of scientific method, which is to say, philosophy. To convince oneself that this must be the outcome, one has only to turn to the end of that divergence which left Sydenham a greater physician than Locke could ever have been; but left Locke a greater contributor to science than Sydenham could ever have become. The end of this development in Sydenham's direction, you all know: the "Observationes medicae," which served the medical practitioner as vade mecum for a century or more. The end in Locke's direction may pretty well be guessed from a final document in the case: it is the paragraph that opens the Second Book, i.e. the first constructive book, of the

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* *Ibid.*, 1: 234.

* *Ibid.*, 1: 225–6.

Essay whose last page was not finished till twenty-odd years after the "Ars medica" was begun:

> Let us suppose the mind [at birth] to be, as we say, white paper, void of all characters, without any ideas; How comes it to be furnished? Whence comes it by that vast store, which the busy and boundless fancy of man has painted on it, with an almost endless variety? . . . To this I answer, in a word, from *experience:* In that, all our knowledge is founded, and from that it ultimately derives itself.* . . .
>
> All those sublime thoughts which tower above the clouds, and reach high as Heaven itself, take their rise and footing here. In all that great extent wherein the mind wanders, in those remote speculations it seems to be elevated with, it stirs not one jot beyond those ideas [which it has gathered from experience].†

With this last citation, all the documents relevant to the small matter of speculation I thought to propose are before us. And the matter itself is no more than this: I am content to admit, on the strength of more evidence than there has been time to submit, that when Locke abandoned the idea of the public practice of medicine, medicine lost a potential contributor of an order not inferior to that of his great admirer, Sydenham. I am willing to admit, that whatever a man's mind may be, a progressively consumptive body is not the best apparatus it could bring to bear on an active practice of medicine. But I am sometimes inclined to wonder whether the difference that separates a Locke from a Sydenham is no more than the difference that lies between a medical mind with a cough and a medical mind without one. I sometimes wonder whether the difference between the life of any special scientist and the life of any philosopher is ever to be accounted to an accident of fate; and whether it does not follow from necessities of temperament, always. Who knows, indeed? Yet this I know: that the two kinds of inquiry, of which the one accepts a method and pushes its application to the utmost limits, while the other questions a method and carries criticism and reconstruction to the most fearless conclusions,—I know that both these forms of scientific endeavor are equally indispensable to the growth of man's spiritual stature. That the application of old methods leads to criticism of them, that criticism brings new methods into application, this is something which had the past not amply proved, the future must have had to discover.

But from this personal speculation, let me turn to more historic matters, to that very matter, if you please, of which at the beginning I promised to speak before the end: the profit to later science of the event, whether accident of fate or necessity of temper, that turned Locke from medicine to philosophy. This profit is genuine enough, yet not the least of it is to be counted, not to what Locke himself accomplished, but to what he made it possible for later science to attempt. What the empiricism developed by Locke, in his "Essay concerning Human Understanding," actually achieved for experimental science was first of all negative; but none the less important for that. It meant much to science to have been relieved of the idea that there are eternal truths, and that its business was to find these and none other. A phi losophy that conceives opinion to be well-founded so far and only so far as it is supported by experience, must admit once for all that, as experience constantly changes, so must all opinion whose validity rests on experience. The advantage science has reaped from turning its attention from a search for eternal truths, to the more profitable task of enriching the experience that should control tentative judgments, is not to be overestimated. To be sure, it is not likely to be underestimated by an age deeply absorbed in the development of its experimental science; yet it is in just such an age that the formula of classic empiricism is most in danger of being misunderstood. History illustrates two such misinterpretations of the Lockean dogma, "All knowledge is founded on experience." The first affects the word *founded*, the second the word *experience.*

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* Essay concerning Human Understanding. 2: 1, 2.

† *Ibid.*, 2: 1, 25.

To the first, I can make only summary reference, since an account of this historic fault and of history's attempt to correct it, to be convincing, would have to be not only leisurely, but also technical. Suffice it to say, that however true it is that all sound opinion is controlled by experience, this does not mean that scientific judgment ever has been or ever could be uniquely determined by experience. To follow the development of this thought, would carry us well beyond the empirical tradition founded on Locke, through the "Critical Philosophy" of Kant, and on to certain developments of quite recent origin. Kant himself would have said no more than this: the more carefully one considers the experimenter at work the more one perceives that in order to get out of experience anything in the way of inductions, he must bring to experience something in the way of postulates. Into the expression of any law observed to be a law of nature, the observing mind will have put something of its own nature; so that Kant might well say: The experimental mind would never have found any law *in* nature had it not first imposed some law *on* nature. For consider the very meaning of experiment and its interpretation. Is it not true that only one who has accepted the postulates of a geometry can sufficiently locate and identify the individual object he is observing, to repeat his observations on the selfsame object? Is it not also true that one who would explain any phenomenon his observation had thus repeatedly established must bring to the task some concept of that cause-effect relation of which every explanation is but a special case and application? No wonder Kant set himself methodically to work to find what postulates or, as he called them, what presuppositions made experience possible. Surely, he argued, if there are postulates without accepting which no experiment could be made, these propositions can hardly wait for their acceptance on the results of experiments about to be made. Thus it will be seen that the critical philosophy of Kant was even more than the empirical philosophy of Locke, a science of experimental method. But what Kant recognized no more than did the empiricists whom he criticised, was the range of equally permissible postulates the experimenter was at liberty to impose on any data his experiments might yield him. At what historic moment the recognition of this freedom anticipated its use, it would take us too long to establish; but all are familiar with the attempt of contemporary science to impose upon the data of experience, not the traditional space-time frame of Euclid, but an alternative designed by Einstein. Less familiar, but no less interesting, is the story of recent attempts to impose on nature a mechanical imagery of a kind differing widely from that which Kant supposed to be the only kind available to the human faculty in its understanding of nature.

To sum up in a word the philosophic development just referred to: an empiricism more experienced and more critical than Locke's would substitute for his phrase, "All knowledge is founded on experience," another; namely, "All knowledge is controlled by experience; but only finally determined by the exercise of a choice, the right and wrong of whose motive is itself one of the most difficult as well as the most interesting problems now facing the theory of science." But this matter can only be well discussed in the idiom of the mathematical physicist, whose science is, so far, the one most interested in arriving at conclusions. Not so a second emendation that certain quite recent philosophers have thought it necessary to introduce into the Lockean formula if anything to be called an *empirical philosophy* is to furnish a sound and sufficient foundation for an *experimental science.* There is, they point out, a fundamental difference between the meaning of *experience* as understood by Locke, and the meaning of *experiment* as understood by contemporary science. The difference is this. The *experiences* on which Locke would have all our knowledge to be founded, not only may be, but must be private states of mind incommunicable to another, impenetrable by another than the one whose experiences they are. The *experiments* by which alone the modern experimentalist would have our scientific judgment to be controlled, are essentially just the opposite: no datum from which induction may set out can be anything less than an observation confirmed by at least one other than the one whose observation it is. As has been said, the motives suggesting this emendation of Locke's philosophy of experience are not technical at all, but are those familiar to every scientist who has ever undertaken to experiment. In fact, all it costs to accept this motive that would transform a Lockean *empiricist* into a radical *experimentalist,* is scientific courage. True, the measure of courage demanded would seem to be somewhat in excess of that which most scientists of the day are willing to expend. Yet how embarrassing the consequences of any failure to meet this issue, may be easily gathered from one historical example. One has only to jump forward a matter of two centuries; from the 1690's, namely, within which appear the four editions of Locke's "Essay," to the 1870's, when an empiricist no less convinced, but far more clear-sighted than the founder, came to consider certain implications that classic empiricism should not have, but actually had consistently overlooked. This contented follower in the empirical tradition was himself a mathematical physicist, W. K. Clifford, well-known to his mathematical colleagues, but more generally remembered for his "Lectures and Essays" addressed to a less technical public. In one of these lectures Clifford is led to consider what we should take to be that *thing in itself* to which our word *observation* or *perception* seems inevitably to refer. To be sure, an *observation* that implied no *thing observed,* would be as strange a phenomenon as a *husband* that implied no *wife*, or a *right hand* that implied no *left*. The critical point in his paper is reached when Clifford comes to consider on what empirical ground I may attribute to my neighbor the thing we call a *mind*; or, more specifically, some particular state of mind, a sensation of *red*, let us say. The nature of the difficulty Clifford experiences in answering his own simple question is best conveyed in his own words. In certain domains of experience, he points out, we are called upon to make inferences profoundly different in nature from any required in the physical sciences. In these sciences, inference is all of a kind, "When I say, there is hydrogen in the sun, the inference means that if one could get some of it in a bottle and explode it with half its volume of oxygen, one would get the group of possible sensations we call water." And the like in all cases where the existence of objects is in question. "But," Clifford continues, "when I come to the conclusion that you are conscious, and that there are [thoughts of] objects in your consciousness similar to those in mine, I am not inferring any actual or possible feelings of my own, but your feelings, which are not, and cannot by any possibility become, objects in my consciousness." Now, an experimental science would be rather shocked, would it not, if called upon to entertain a belief in the existence of things it could never by any chance observe? Not so, however, this all-too-clear, and yet far-too-timid empiricist of the Lockean tradition. Does he give up his faith in other minds, just because his philosophy can furnish no evidence of their existence? Not at all; he clings to the inference however unverifiable, by which alone he can hope to save his neighbor's mind. He says:

> To be sure, how this inference is justified, how consciousness can testify to the existence of anything outside itself, I do not pretend to say; I need not untie a knot which the world has cut for me long ago. It may very well be that I myself am the only existence, but it is simply ridiculous to suppose that anybody else is. The position of [solipsism] may therefore be left out of count, although each individual may be unable to justify his dissent from it.*

I make no comment. Here we have an account of how one learns by experience; this account ends in the discovery that one can learn nothing in this way concerning the experiences of one's neighbor; nevertheless the learner is advised to abide in the way of the world, to accept with the man in the street the fact of his neighbor's mind, to let evidence go hang rather than lose a brother-soul. It may be that in this medical company, accustomed to letting its treatment of fellow-mortals depend on such evidence as laboratories and clinics yield concerning their bodies and minds, one or another will find something unsatisfactory in an empirical philosophy that in all practical matters lets evidence go hang. If so, there is no reason any should abide in that kind of empiricism. There is in this day an alternative: it calls itself not an empirical, but an experimental philosophy; and I should still be content to leave its distinguishing postulate in the form in which I wrote it down several years ago.

This philosophy would contend:

> Nothing may be called matter of experience, but what can be made matter

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* On the Nature of Things in Themselves. Abridged.

> of experiment; and nothing may be made matter of experiment for one, save what can be made so for all. No experience then can be so subjective to me, so beyond my neighbor's reach, none so subjective to my neighbor and so beyond my reach, but that both experiences are within range of the experimental observation of me, my neighbor, and all the world beside. The only question is, How does one learn to perform and interpret experiments of this order? But that is a sound scientific question demanding a scientific answer; for while any one may guess at whatever facts of mind he pleases, only a well-developed psychology can subject these guesses to experimental control.*

Whereupon, it seemed to the writer worth devoting considerable time, and engaging the help of others, in developing mathematical expression for what we mean by such psychological terms as intensity of sensation, degree of intelligence, strength of will, etc., in order that such quantitative things might be experimentally measured. Of course, it does, as has been said, take some courage to maintain that no man may keep the secret of his soul safe from the penetration of science; I am far from urging any here present to follow me in this audacious break with good old-fashioned empiricism. When some twenty years ago I first published on these matters, the critics thought me not a little mad; or, as one German put it, *all zu wagbalsig*. But since then, I believe the idea of treating mind as an object to be experimentally studied to have made some progress; I still look forward to a future, in the course of whose development we shall come to take our neighbor's states of mind less and less as unverifiable hypotheses, more and more as objects of experimental investigation.

But that may wait. For the moment, I am only anxious not to let my story of what went into and what came out of your colleague and mine, John Locke, end without a word of explanation. In my enthusiasm for the philosophy that has developed *since* Locke, I may have seemed to forget that it developed *out of* Locke. If so, let me first hasten to recall that *criticism* and *experimentalism* together, however they depart from Locke, do but represent a liberalization and extension of the *empiricism* this hardy, patient, and above all sane thinker offered to the world of his day. And then let me suggest that in all this development of a thought of which he knew only the beginnings, Locke himself, were he with us today, would see no more than his own hope's fulfillment. There is a letter, written in Locke's last days to a young man in whom he saw the promise of a future that might continue the past of his own long labors. Something of what Locke then wrote to the youth that was to outlive him, I would willingly accept as his message to all of us who come after:

> You say a great many very kind things [Collins], and I believe all that you say. If I were now setting out in the world, I should think it my great happiness to have such a companion as you, who had a relish for truth, [and] would in earnest seek it with me. Believe it, my good friend, to love truth for truth's sake is the principal part of human perfection in this world. When I consider how much of my life has been trifled away in beaten tracks, where I vamped on with others only to follow those that went before us, I cannot but think I had just as much reason to be proud,

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* Singer. Philosophy of experiment. *The Symposium*, 1: 2, 1930.

as if I have travelled all England, and, if you will, France too, only to acquaint myself with the roads and be able to tell how the highways lie, wherein those of equipage, and the herd too, travel. Now methinks,—and these are often old mens' dreams,—I see openings to truth and direct paths leading to it, wherein a little industry and application would settle one's mind with satisfaction, and leave no darkness or doubt. But this is at the end of my day, when my sun is setting; and though the prospect it has given me be what I would not for anything be without—there is so much irresistible truth, beauty and consistency in it—yet it is for one of your age to set about it.*

This letter was on June, 1703. Locke died October 28, 1704. It is for those of our age to set about it.

* Fox Bourne. 2: 521. Abridged.

DISEASE AND HISTORY*

By DAVID A. STEWART, M.D., F.R.C.P. (C), L.L.D.

NINETTE, MANITOBA

TO Doctor Samuel Johnson history was "a narration of events and facts delivered with dignity." Our questioning and de-bunking generation laughs away the dignity, cross-questions the hoary facts, and most of all searches behind and beneath and about them for their reasons. Very rightly we will insist upon knowing not only what, but why. Hysterical mobs flocked in delirious Crusades to the Holy Land. We ask, why? Busy Babylon, ancient Egypt, great Greece and dominant Rome declined and fell, or crashed sheer to stark ruin. We must know wherefore. Tribes and nations wandered hither and thither, and their destinies ebbed and flowed. We must have reasons for all these things.

What were the forces that shaped for good or ill? Land bridges between continents, ice ages, glaciers, mountains, valleys, rivers, deserts, green pastures, ocean currents, arms of the sea—these we know shaped history. But if the things by which men live and move and have their being make history, what about the things by which men sicken and die? If strife between man and the elements, or between man and man, make history, what about the strife between man and disease? If history is a record of man's gradual adjustment to environment, his gradual conquest of nature, his innumerable mistakes and slow correction of mistakes, and of his general pursuit of life, liberty and happiness, what about his age-long environment of epidemic and endemic disease, and his gradual conquest of disease? If these are not makers of man's history what are they?

When disease and death meant only blind strokes of fate or open acts of God there was less need to ask why they fell. But to modern men diseases are the logical effects of partly known natural causes. The microscopes of science find their germs or seeds. The headache that saddens the cold gray dawn of the morning after,—what is it but the logical consequence of some unholy joys or indiscreetnesses of the night before? Such causes and such effects are surely the very stuff that history is made of.

And now that the causes of disease are among things known and understood, it is time that they should be given their places among elements in history. There is no doubt that historians have always overdone physical violence as a maker of history, and have packed their pages with wars, rather than the reasons for wars. One wandering knight in tin-pot armour is dearer to them than a thousand plowmen or bakers or candlestick makers, who merely tilled the soil, married wives, built houses, and lived as decent folk. Even our daily historians of the press are inclined to muckrake the five continents and the seven seas for the murders and banditries, the thefts and adulteries—the sound and fury of the day—to fill their pages withal. Violence does belong to history both

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***A Lecture under auspices of University of Manitoba, Winnipeg.**

past and current, but it is not the whole of history either past or current, nor indeed the greater part of history.

It has been said also that the history of a nation is the history of its great men. But some of the greatest men have few pages, and some of the least men many pages in the chronicles. The little Corsican, Napoleon Bonaparte, who shot mankind to pieces in scores of pitched battles, swaggers through thousands of volumes. The little Frenchman, Pasteur, who led the forces of science against darkness and disease, and beat them back in fifteen glorious battles, may have but a few paragraphs in the general history even of his own country. An English country doctor, Edward Jenner, found smallpox killing one in every ten throughout Christendom, and disfiguring one in five, "the most terrible of all ministers of death—always present and filling the churchyard with corpses, tormenting with constant fear all it had not yet stricken, leaving on those it spared the hideous traces of its power, turning the babe into a changeling at which the mother shuddered, and making the betrothed maiden a horror to her lover." Jenner's tremendous discovery not only rescued his own stricken generation but added three and a half years to the life of man for as long as the race shall endure. At the very same time the wars of Napoleon wasted the flower of France until they had cut an inch from the national stature. No need to ask, which was the better man? But the question we would ask is, which left the greater mark on the race? Which more definitely made and moulded history?

And wherein is the French Revolution of 1789 so very much greater than the Lister revolution of 1867, which "brought the whole world out of a septic purgatory into an aseptic paradise?" One created horrors for one generation and one nation, while the other saved the whole race from many horrors for all time to come. To have an assured place in history it is better to kill than to bless. "As long as mankind shall continue to bestow more liberal applause on their destroyers than on their benefactors the thirst of military glory will ever be the vice of the more exalted characters" (Gibbon). To the destroyers of men we offer garlands and Roman triumphs; to the saviors of the race, Gethsemane, the hemlock, and the cross.

> And everybody praised the Duke
> Who such a fight did win,
> But what good came of it at last?
> Quoth little Peterkin.
> Why, that I cannot tell, said he,
> But, 'twas a famous victory.

As It Was in the Beginning

Disease, then, and the gradual control of disease, are tremendous moulders of the history of mankind. There is much in the saying of Sir Thomas Browne that the world is not an inn, but a hospital. Yet writers of history will analyze most laboriously and chronicle most voluminously the smallest and remotest wars, but almost overlook the greatest plagues or the deadliest epidemics or the most epoch-making conquests of disease. If we will but take a walk with seven-league boots over parts of the past centuries we will find overwhelming evidence of disease and the conquests of disease as tremendous makers of history.

We can presume that the greatest struggles of prehistoric man were with outward and visible foes, with wild beasts and ape-men, with forest and flood and famine. But disease was a very real element also. Their cruel struggle for existence wore them out prematurely, and prehistoric germs stiffened prehistoric joints with "cave gout."

We are not left altogether to guess about the beginnings of either the blessings or the curses of civilization, for we have the transitions from primitive isolation to the most complex community life spread out before us in the round world even of today. Indeed we of the western continent can see almost all stages of the change, among our neighbors the Indians.

The nomadic, patriarchal family groups, separated by wide open spaces from other groups, camping here today and away tomorrow, before soil or stream or well became polluted, avoided many of the dangers of community life. But when they struck their tents for the last time, when a small measure of cooperation gathered them into clans, when the rough-neck, self-acting, opinionated barbarians became somewhat broken to community ways, as their own colts were to their hands, when they were willing to lose a few of the liberties of the individual for the advantages of the tribal protection, when they began to make laws, and, still harder, to obey them in order to live together as tribal units, a fateful Rubicon in the life of man was passed. Patriarchal life in the open spaces was simple and foolproof compared with life of even tribal and village communities. The Latin *civis* means "citizen." To civilize is not to provide with gee-gaws such as railways or silver cutlery or radio, but to citizenize, to train in cooperation. *Civis* means citizen, and civilizing is citizenizing. The proofs of civilization are not aeroplane flights, but the observing of quarantines, the tidying up of picnic grounds, helping the policeman, and learning that we must not shoot the sheriff.

Man is a poisonous animal, and it needs either science or much elbow-room to keep him from poisoning himself and his fellows. In the earliest cities there was neither science nor elbow-room. Collections of cave-like houses huddled within high city walls into hill-top, waterless, cities accumulated dirt of all sorts, the excretions of man and his domesticated animals, the refuse of his food, even the dead bodies of his ancestors. With earth, air and water polluted, the sun smote the reeking streets by day, and the moon by night. The thick walls and gates that kept out visible enemies bred myriads of invisible enemies. Darwin, who did not know as much about these minute organisms as we do, observed that, "spots of soil became pestilential by human occupancy." The first fixed houses of our own Indians we know well, hermetically sealed, over-heated, dirty, with acres of polluted soil about them. A hundred such, crowded in an old-time town built for defense, and permanent—think of them!

Even as late as 1500 or thereabout, Erasmus, visiting England, was shocked by what he saw—and smelled—and considered that the sweating sickness which "there chanced to be at that time" had its cause in "the bad houses and bad ventilation, the clay floors, the unchanged and festering rushes, with which the rooms were strewn, and the putrid offal, bones and filth which reeked and rotted together in the unswept, and unwashed dining halls and chambers."

The first steps, then, of the nomad in civilization, the gathering of houses into towns doubtless trebled disease and cost innumerable lives. Sanitation belongs to the last century. Edinburgh a century and a half ago, as Boswell and Johnson saw it—and smelt it—would be almost unthinkable today. Sewers were open to sun and sight and smell in Baltimore even in Osler's day. The marvels of a well-appointed bathroom are the very peak of sixty centuries of science. Slums in city and country are primitive spots in a modern civilization.

PRIMITIVE COMMUNITIES PROTECTED BY ISOLATION

Primitive communities were saved from utter extermination chiefly by their instinct for isolation. They kept themselves and their manners and their magic to themselves, and took care not to import manners or magic, or disease, from the outside. So their diseases were few, they had suffered them from time immemorial, and had gradually come to resist them fairly well. Sir Thomas Browne believed that "The mercy of God hath scattered the great heap of diseases, and not loaded any one country with all." In primitive communities strangers were taboo, and, as Frazer tells us, the fundamental idea of a taboo is protection from danger. Strangers were suspected of magic and witchcraft and baneful influences generally. The sense of danger in the coming of strangers had ages of clan experience behind it. What strangers actually brought were new disease germs, which were invisible, and the new magic, which was more visible, got the blame. Among savage peoples, therefore, Frazer states:

> Before strangers are allowed to enter a district or at least before they are permitted to mingle freely with the inhabitants, certain ceremonies are often performed . . . for the purpose of disarming the strangers of their magical powers, and of counteracting the baneful influence which is believed to emanate from them, or of *disinfecting*, so to speak, the tainted atmosphere by which they are supposed to be surrounded.

The instinct of the savage led him to receive strangers with primitive antiseptic measures. One Borneo tribe thus fumigates them with burning bark. Certain Java islanders sprinkle and anoint strangers, and wipe them and their boats with green leaves. A Bechuana tribesman who has been away must be purified and shave his head to get rid of any evil he may have contracted from strangers, before he can come back into his own tribe. Hebrew soldiers returned from war, and even the plunder they brought, had to be purified before they were allowed within camp or town. A woman captive had all her hair shaven and was isolated a month before she was given freedom in camp or city. Envoys to a Tartar Khan, and their goods also, must needs pass between two purifying fires before they entered the august presence. Such purification the ambassadors of the Emperor Justinian had to perform to exorcise all harmful influence before they could deliver their messages to the Turks.

All this means that primitive peoples have a sense of security in isolation, and a fear of harm from strangers, likely derived from old and long-forgotten but painful experiences of their ancestors. They have an intuitive sense of the well-known "invariable rule that the first epidemic of any disease in a community is especially virulent, each successive attack conferring a certain immunity," or, as stated by Effertz: "All newly introduced infectious diseases are specially malignant, and all specially malignant infectious diseases are newly introduced."

New diseases brought by discoverers and conquerors and colonists have again and again found virgin soil in primitive races and wiped out whole populations. Islands in the South Seas have been depopulated by measles, smallpox and tuberculosis. An old Fiji chief and his son brought back from a state function in Australia measles that killed one-third of their people in a first wave, and more in succeeding waves. In the Faroe Islands at the time of their comparative isolation, 6000 people out of 8000 were stricken by measles, and many died. Boers, to whom measles was a new disease, lost one-fifth of their numbers from it in concentration camps. Senegalese in France in the Great War had a death rate from tuberculosis—for them a comparatively new and rare disease and therefore poorly resisted—one-hundred and seventy times greater than that of the British. In Sudanese tuberculosis runs an acute and rapid course of about a month, whereas Jewish people, from long experience of this disease, have a wonderful resistance to it. Rome conquered a part of Europe, and unwittingly, but surely, tuberculized it. Within the boundaries of the old Roman Empire peoples resist tuberculosis fairly well, because it is an old disease to their races. But where the Roman eagles never flew, and where infection came much later, resistance is lower. The nearness of tribes and races to Rome, or the measure of their subjection to Rome, two thousand years ago, is a rough measure of the racial resistance of their descendants to tuberculosis today.

Smallpox, leaking through from the Spanish settlements in California in 1781, swept off more than half the Western Canadian Indians, and other waves followed. In New England whole tribes disappeared within a few years through contact with the colonists and their new diseases. Fifteen years after Columbus' first sight of the new continent, smallpox broke loose among the natives of Mexico and killed, it is estimated, three and a half millions of people. Whole tribes were wiped out. "The destruction of the races of the West Indian Islands is due not to the cruelty of the Spaniards but to the malignity of newly imported diseases." When Leif Ericson landed in America about the year 1000, and went away again, leaving little impress on the continent he had discovered, if he had only brought with him in his Viking ship two great civilizing agencies, gunpowder and smallpox, the history of modern America might have begun five centuries earlier. And had the Spaniards not been equipped with these civilizing agencies our race might still be standing at defensive on a half-conquered continent. New disease, like the proverbial new broom, sweeps clean.

Even medieval communities were isolated to a degree we can scarcely imagine. Each was a small world in itself. It had little intercourse with the other small worlds about it, and wished for little: it had none with the world at large. It grew its own food and consumed it; wove its own clothing and wore it; developed its own special diseases, became accustomed to them, and kept them also to itself. It was content to live unto itself, sicken unto itself, and die unto itself. A man of another community, with other language, or dress, or usage, or religion, or disease, might be welcomed by a hammer tap upon his cranium, or a spear insinuated between his ribs.

DISEASE FOLLOWS TRAVEL

Like other manufactures, disease was at first for local use, but by and by found a wider market. When other commodities were exchanged between village and village, infections were exchanged also. Local disease became tribalized, then nationalized, and now finally internationalized. Where merchants went, there went disease, and the wiping out of nations has been among the incidents in the grand march of commerce. At first these disease commodities just dribbled in and out with hardy adventurers, then more freely by caravan and coasting felucca, still later by train and steam packet, until now we can import and export them with the speed and efficiency of the aeroplane. In the second century A.D. it took plague forty years to reach China from the Red Sea. In the fall of 1888, well along in the age of steam, an influenza epidemic was at Hong Kong. By the beginning of the next November it was in St. Petersburg. November 1889 saw it also in Germany and France, December throughout Europe, January throughout America, and May 1890 in India and Australia. Smallpox, known from time immemorial in some fastnesses of Asia, did not reach Europe until it followed trade routes in the sixth century. The Plague in the eighth century was scattered through Christian countries by Venetian and Greek ships engaged in a contraband slave trade with the Mohamedan nations. Of a hundred youths sent by the Chians to the oracle at Delphi, all but two were killed by pestilence. Asiatic cholera belongs to India, and scarcely got out of it until a century ago, when it began to overflow along routes of trade. As late as 1892 it scourged Hamburg, killed eight thousand, and was carried out by railways to 268 different places before it was overtaken and stopped. When alpaca and mohair were brought to England in 1837 anthrax came with them. Hair and hides from Russia or South America or China brought this fatal disease to tanners in Connecticut, and infected cattle and fields along streams flowing from the tanneries. The *anni Santi*, or holy years, at Rome, have often been followed by pestilences, carried there by many pilgrims. Even as late as 1900, after the arrival of the Piedmontese pilgrims, the incidence of influenza rose to 60,000 a week. Every seaport in the world is guarded against the importation of diseases every day of the year. Fortunately with modern commerce we have modern growing knowledge of disease control.

EPIDEMICS AS EXPORTS

Travel and trade, then, spun many a thread from community to community which gradually wove themselves into the warp and woof of a complex world civilization. As travel increased, trade extended, and communities became more complex and interdependent, the defense against disease that isolation gave was lost. Diseases endemic in their own communities, as measles is in ours even in this age of enlightenment, leaked out to become epidemic scourges in the virgin soil of new communities, or frightful pandemics throughout the whole of civilization. This period of wider and wider spread of disease, and yet no better control of disease, was one of terrific loss of life. A hundred years ago McKinnon sifted over all records of the first seventeen centuries of the Christian era and found that there had been a famine somewhere in the world on an average every seven and a half years, and a plague or pestilence somewhere every four and a half.

Each of these 377 pestilences made history for some community or country, and some convulsed whole continents. Consider as an example one form of visitation only, the bubonic plague. This is primarily a disease of rodents, chiefly rats, and is carried by rat fleas. It had three chief historic centers, in the Himalayas, Arabia and Uganda, but trade very easily carried it to every port. We are safeguarded against it only by the vigilance of health officers. In ten years preceding 1907 it carried off six millions in India, 46,000 in 1910 in Manchuria, and as late as 1923, killed a quarter of a million people, mostly in India.

One of the few statements about disease, in books of general history, is that "a great plague throughout the Roman Empire between 164 and 180 A.D., in the reign of Emperor Marcus Aurelius probably did much to disorganize social life and prepare the way for the troubles that followed the accession of Commodus." Spread by the troops returning from putting down a rebellion in Syria, the plague, "depopulated entire cities and districts, so that forests sprang up in places before inhabited," and brought upon the Roman Empire a whole century of confusion. Niebuhr considered that, "the ancient world never recovered from the blow inflicted upon it by the plague which visited it in the reign of Marcus Aurelius." This same pestilence, raging in the East as well as in the West, ended four hundred years of comparative peace in China, the dynasty fell "like a rotten tree before the gale," and the whole nation was thrown into the greatest disorder. Earlier still, pestilence broke up the Trojan war. It was by this scourge and pestilence in the hands of fate that Aenaeus and his family were driven to southern Italy to become the founders of Rome. In the confusion following the catastrophe of Pompeii the plague slew 10,000 daily. Plague stayed the ravages of Atilla the Hun in Northern Italy in the fifth century, and weakened Italy's resistance to the Lombards in the sixth. Thousands died daily in Constantinople. Gibbon states:

> Not for fifty years did mankind recover their health, or the air resume its pure and salubrious quality . . . The triple scourge of war, pestilence and famine affected the subjects of Justinian, and his reign is disgraced by a visible decrease in the human species, which has never been repaired in some of the fairest countries of the globe.

Plague stayed the army of Emperor Otto in Italy in 963. It destroyed the whole German army at Rome a century later, and in the twelfth century defeated, dispersed and annihilated the wild soldiers of Emperor Frederick Barbarossa.

THE BLACK DEATH

Even such carnivals of death and disruption appear small in comparison with the Black Death, probably the pneumonic form of the plague, which swept the whole known world, and reached England in 1348. Beginning in Asia, it killed thirteen millions in China. Men in the grip of disease distresses neglected the river embankments, and famine followed pestilence. Genoese soldiers returning from the siege of Caffa in the Crimea carried infection wherever they went. Crowds came down to the ships to welcome them. "Woe unto us," writes one of them, De Mussi, "for we cast at them the darts of death. Whilst they embraced us and kissed us, we scattered the poison from our lips. Going back to their homes they in turn soon infected their whole families, who in three days succumbed." Villages and towns were left without inhabitants. In London fifty thousand bodies were thrown into one burying ground. In a year, in Europe, twenty five millions of people, half the population, died. Such a visitation shook the foundations of society, and threatened the extermination of mankind. Petrarch who lived through it thinks the true story will never be believed by other ages.

> If you enquire of historians, they are silent; if you consult the physicians, they are at their wit's ends; if you question the philosophers, they shrug their shoulders, wrinkle their brows and lay the finger on the lip. Is it possible that posterity can believe these things? For we who have seen them can hardly believe them?

EFFECTS OF THE BLACK DEATH

Such a convulsion of humanity must needs make history. What history did it make, say in England? Its moral effects seem contradictory. "The mental shock suffered by all nations by the plague is without parallel, and beyond description" (Hecker). "Amid the general lamentation and woe the influence and authority of every law, human and divine, vanished." On the other hand, it broke bonds that needed to be broken, and gave the common man a voice in the nation. It paralyzed trade and industry, especially agriculture, but, to even up, it paralyzed also war and politics. It emptied towns, but later, "It detached people from the soil, drove them into the towns, increased urban population at the expense of rural, planted the germs of commerce and industry, and began the expansion of England manifested in the time of Elizabeth" (Seebohm).

One of the first definite effects was a stampede of people out of England, and, as the King and his counsellors feared, carrying away not only population, but money. So it was enacted:

> For-as-much as no mean part of the people in our realm of England is dead in the present pestilence, and the treasure of the said realm is mostly exhausted, and numbers of this our Kingdom are daily passing, or proposing to pass to parts over sea, with money which they were able to have kept within the realm; now we, taking heed that if passage after this manner be tolerated the kingdom will in a short time be stripped both of men and of treasure, and so therefrom grave danger may easily arise to us and to the said realm, unless a fitting remedy be speedily appointed, do command the mayor and bailiffs [of forty-nine ports] to stop the passage beyond sea of them that have no mandate, especially if they be Englishmen, excepting merchants, notaries, or the King's envoys.

The church suffered heavily. No class lost more proportionately than the clergy. "Penitent and confessor were hurried to the same grave." "Few of the first rank died, but of the common people an incalculable number, and of the clergy and the cleric class a multitude known to God only." Soon the ranks of the priesthood were filled with men very poorly equipped whether in scholarship or in morals. They demanded higher wages also. "Whereas before the pestilence, when there were plenty of priests, a chaplain could be got for five or even four marks, or two marks and board, after the plague hardly a worthy cleric would accept a vicarage, even for twenty pounds." Before the plague it is well authenticated that there were thirty thousand students at Oxford; after the plague six thousand. The King, poor man, was greatly concerned, and wrote the bishops about the falling off in students at Oxford, and also about the priests. He urged that the clergy be increased in numbers, in morals and in knowledge. The wild excesses of the flagellants may be traceable in part to this weakening of the orthodox church.

But if the clergy suffered, one profession found its opportunity in the plague. Gascoigne who was a little later Chancellor of Oxford tells us that "before the Great Plague in England there were few quarrels between the people, and few law cases, and so there were also few lawyers in the Kingdom of England, and few in Oxford." But with ten times the usual number of wills to probate, many dying intestate, families wiped out, successions to settle, feudal claims to adjust, London especially became filled with lawyers. Several of the inns of Chancery which still persist had their origin in the general upset of the Great Plague. And when this bit of extra business had been cleaned up, along about 1455, it was thought necessary to enact some sort of a law to put out of business at least a few of the "enormous numbers of pettifogging attorneys, especially in the city of London." Thus does one plague lead sometimes to another.

But the greatest effects were economic, and on the land. "The catastrophe of the Black Death swept the manorial system into the clutches of the law of supply and demand in its grimmest form" (Lord Ernle). Laborers were just barely out of serfdom, and small wages beginning to be grudgingly paid them by their former masters and lords, when more than half the laborers were suddenly swept away. Wages increased three and four fold. Landlords were in despair. Parliamentary law must be made to over-ride economic law. In 1350 it was enacted that laborers, "Shall be obliged, when required, to serve any master who is willing to hire them at such wages as were usually paid in the locality in the year 1346, or on the average of five or six years preceding." It became a breach of law to demand, or even to offer, higher wages than the old rate. Handicraftsmen were to be paid also at the old rates. Traders in foods were enjoined to sell their wares at reasonable prices. A year later a scale of wages was established, and the migration of laborers from the parish in which they were born, to other parishes, was forbidden. A brand was burned upon the forehead of those who were found guilty of going beyond their communities for work. Even the harboring of laborers was crime. And yet the old wages would not sustain life. In some places the new laws were ignored, and there was peace. Elsewhere there were riots and disorder, and bitter strife between capital and labor. Men formed combinations for protection, labor unions. Laborers fled to the cities or became "Wasters that would not work, but wandered about." So it was made unlawful even to give alms to beggars.

John Ball declared the rights of men. "When Adam delved and Eve span, who was then the gentleman?" Long Will Langland sang the song of Piers Plowman. But the counsels of violence prevailed. Things went from bad to worse until they came to a head in the rebellion of Wat Tyler. Thus directly the Black Death led to the peasant revolt, the first distinct clash between capital and labor; and the asserting of the rights of common men to a share in the government of the country. Is not disease a tremendous maker of history?

It did not pay now to cultivate manorial farms and pay wages, so the larger proprietors leased or sold their land to smaller holders. And because there were many farms and few surviving men to lease them, rents had to be low. Land was distributed to more people; and thus arose, for the good of his country, the English yeoman.

Common men who survived the Black Death a few years found themselves in bettered economic position, with land cheaper, rents lower, wages higher. The cities rose and asserted their rights. And when the common man began to speak for himself, it was not in Norman-French, but in Saxon-English. Langland argued, and Chaucer sang, in the old-new English tongue.

So with desolation came elbowroom and opportunity. It was chiefly the stronger of the people who were left. No property had been destroyed. Each survivor had the share of two. A recent writer will have it that out of the Black Death, as butterfly from chrysalis, came the Renaissance:

> The net result was that Europe emerged from the pandemic with the old pressure of population relieved, all the worst problems of politics in abeyance, plenty of money, and a newly found leisure. The best brains of the time thus suddenly emancipated began to function freely and magnificently. There followed what we call the Renaissance.

SPREAD OF DISEASE BY WAR

We have already seen how travel carried disease from isolated communities out along trade routes into new communities, in which it became epidemic and virulent. The travel of armies in primitive or medieval war was travel at its very worst for all possible reasons. It was the slow progress of an undisciplined and bedraggled host that gathered its living and its wages with its own hands from the unfortunate populations that lay along its march. It was travel with violence, travel with passions loosed, travel with license, robbery, murder and rape, travel with the burning of houses and towns, travel with the quartering of wretched diseased soldiers, and vile camp followers of both sexes, upon unoffending households. It was travel with pollution of soil and streams, and houses, with the eating up of the food of the people, travel with terror before it and famine and pestilence always behind. The modern transportation of armies by trains spares civilians along the route from much agony and disease.

Some of the actual fighting between medieval armies was not very terrible in itself, little worse sometimes than a rather keen competition in athletics, with ransom as a sort of forfeit, and plunder as prize. But the essential strategy was "wolf strategy," the wearing out of a people by violence, plunder, starvation, disease and death.

If the march of an ancient army was travel at its worst an ancient or medieval siege was sanitation at its worst. "War," said Prince Hal as he laid siege to Rouen, "war has three handmaidens, fire, blood and famine, and I have chosen the meekest maid of the three." From the fifteenth century to the seventeenth, sieges were the fashion, and were nearly twice as numerous as battles. Imagine, or try to, a medieval city in state of siege, with scant water supply, haphazard sewage disposal, hand-to-mouth supply of half-rotten food, foul streets, crowded houses, the population swelled by refugees and by a rabble of soldiers, the sick, the wounded, infected and infecting, the dead bodies, the famine, the war pestilences, typhus, typhoid, dysentery, smallpox, scurvy. On the surrounding hills sat the enemy with camp conditions almost as foul and fatal—but not quite. This gave the better chance to the besiegers. Such warfare was just a gruesome test of endurance in which victor lost with vanquished.

The association between war and disease is as old as war itself. It has been said, and repeated often, that all they who take the sword shall perish by the sword, but it was early realized that they who took the sword perished much oftener by the pestilence.

> The sword is without, and the pestilence and the famine within . . . he that is in the field shall die with the sword and he that is in the city, famine and pestilence shall devour him . . . shall destroy both the young man and the virgin, the suckling also with the man of grey hairs.

"All that we gained in the end by engaging in the Crusades," said Voltaire, "was the leprosy. And of all that we had taken that was the only thing that remained to us." Every campaign and every crusade spread disease back and forth among nations eastern and western. The special epidemic distributed by the seventh Crusade was dysentery. Marching in triumph through Rome the army of Cassius sowed seeds of plague brought from Syria that spread desolation even into far Gaul and Germany. Typhoid fever, carried home from a Turkish campaign, killed more Spaniards than the swords of all the Moors. All wars with the Turks have been pestilential. He should have a long spoon who sups with the devil. Henry Fifth wore down Harfleur by siege, and won it, almost without fighting, but lost 2000 dead and 5000 ill from dysentery. His army was still reduced and ill when Agincourt was fought. The army of Charles Eighth, roaming through Europe in 1494–5, spread syphilis, until this disease reached the proportions of a European pandemic. Since this immediately followed the re-discovery of America by Columbus, the two events are sometimes confused, and syphilis said to have been brought over by Columbus. Perhaps it was. Still more likely it was communicated to the new population of America then brought back intensified from the new soil. The sweating sickness that followed the wars of the Roses killed more Englishmen than the long years of fighting.

The marches and counter-marches of armies across Europe in the Thirty Years' War lighted among civilians and noncombatants wherever they went, the pestilences peculiar to war. These raged long after the armies had passed, and destroyed, it is estimated, half the population of central Europe. Mansfield's army left typhus everywhere behind it; 20,000 Bavarian soldiers died of it in one year. A bare bald enumeration, city by city, state by state, of losses through disease, in Germany only, in Thirty Years' War, simply a tabulation, without any elaboration, as published by the Carnegie endowment, occupies 53 printed pages. It was not military losses, but losses by pestilence that so deeply prostrated these states. Napoleon's army retreating from Russia was ruined not only, as Napoleon said, by "General January," but by General Pestilence. Even the Russians who followed the retreat lost 62,000 men in three months from disease. In one year 55,000 were buried in Vilna alone. And when prisoners were restored to their own countries they carried back with them, and spread widely at home, the diseases of military camps and prisons. Military hospitals every where, even as far behind the lines as England, were "centres of contagion."

In the siege of Mantua one-third of the people were sick, one-third of the garrison died, and the siege cost 20,000 lives, with scarcely a blow struck. In besieged Danzig one-half the soldiers and one-quarter of the civilians died. At Torgau in 1813, 30,000 French soldiers died, mostly of disease. Saragossa capitulated only after half of its 100,000 people had died, most of them from typhus. At Mayence in 1813 two thousand oxen in the city became diseased, had to be killed and salted down, and even that choice provision spoiled. One-third of the soldiers and one-tenth of the civilians died. Almost in our own day 75,000 died in Paris during siege. When Metz was besieged in 1552 by 80,000 Spaniards and French, Duke Henry of Guise, who defended the city, sent away the sick, or isolated them, cleared out refuse, washed the streets and houses, cleaned up the city, and had a fairly comfortable time. The enemy, with the usual rotten camp, lost heavily meanwhile, and was forced to raise the siege. In the siege of Damietta 3000 only were left by scurvy and other pestilences out of 80,000 defenders. These were all ill, and the streets were filled with unburied corpses. The whirlwind defeat of France by Germany in 1870 is well known, but it is not so well known that pestilence, especially smallpox, carried into Germany as a result of the war, killed more people than France had lost by sword and pestilence combined. Typhus was carried back by soldiers from the Crimea to English hospitals. In the Great War, British soldiers carried back dysentery from Egypt, and Von Kluck's German army carried it from the South into France, in 1915. In the Salonika campaign the malaria-carrying mosquito was a far more formidable enemy than the Bulgar.

What is the conclusion from all this recital of horrors? This at any rate. If war has been a sort of ultimate big stick among races and nations of men, and so has made history, the heaviest part of that big stick has been not the wounds but the pestilences of war. Even when the armies alone, and not populations, are considered, the losses by disease have been often ten and twenty times greater than the losses by wounds—right up to our own generation. In the Peninsular war the French lost 100,000 to the arms of the enemy and 300,000 by disease, mostly typhus. Of the army of the Duke of Wellington 9000 died in battle and 25,000 of disease. Two Northern soldiers in the American Civil War died of disease for every one who died by the weapons of the enemy. In the South African war the same proportion held; typhoid fever alone killed 43,000 and weakened many more. In the brief Franco-German campaign the immediate disease losses were comparatively low, but the ultimate disease losses, as has been pointed out, were high.

For the first time in recorded history, in the Japanese army, in the Russo-Japanese war, proportions were reversed, and two died of enemy wounds for every one who died of disease. This tremendous saving of life and conservation of military strength was accomplished simply by putting into use in all details what was already known but mostly unapplied, of the modern science of preventive medicine. From the British army in South Africa 31,000 were invalided home on account of typhoid fever. From General Oki's army three years later only 133 were sent home for the same reason.

In the Great War there were times when disease was considered almost "a negligible factor." The American losses from disease were one-fifteenth what they would have been had Spanish war rates prevailed, and one-twenty-sixth what they would have been at Civil War rates.

Even the mere gathering of recruits for war is a spreader of disease. Vaughan and Palmer report that "The hardships of war and trench life are of less consequence in producing sickness than the admission of new recruits to the ranks." In the early years of the war the sickness rate was higher in barracks in Winnipeg than among Canadian troops in the trenches in France. All that the young recruits had missed at home of measles, whooping cough, mumps or pneumonia, was waiting for them in the crowded camps. The American mobilization camps filled with country boys, who had so far escaped many infections had the highest infection rates: camps which drew men from the cities, where the recruits already had "had" nearly everything that could be "caught," had the lowest infection rates. Having already had most things there was little left to take. The arrival in Europe of large drafts of non-immune Americans is given as one cause of the pandemic influenza of 1918.

So, though the weapons of war have slain their thousands, and the weapons of modern war their sadly increasing thousands, the pestilences of war have slain their tens of thousands, and still slay. If war, then, is a maker of history, ruthless and terrible, the diseases that follow in the train of war are makers of history, even more ruthless and more terrible.

DISCOVERY AND COLONIZATION KEPT BACK BY DISEASE

Two-thirds of the world was unknown to the other third until four hundred and fifty years ago. Discovery, exploration, colonization, depended upon many things, larger ships, skill in navigation, the mariner's compass, the breaking away from old traditions. But there was still at least one greater obstacle. Worse than the sudden storm-cloud or the boisterous waves for those who went down to the sea in ships to do business in the great waters, was scurvy. With small ships, horribly crowded quarters, no ideas of sanitation, poorly preserved foods, worst of all, as we know now, foods with essential elements lacking, a fortnight out, a ship was a hospital; a month out, a morgue. Legs and arms swelled, gums softened, teeth fell out, the whole body became noisesome and rotten. Then came death.

When a long voyage was likely to kill one-third of the crew; when it needed three men for one job, and the East India Company had to send out, "In every of the said ships *three* merchants to succeed one the other, if any of them should be taken away by death"; when fresh crews had to meet India ships at Lands-End and help them to hobble up the channel; when wintering in new lands was as bad as sailing the sea, no wonder this "calamity of sailors" discouraged discovery, exploration and settlement.

By the time Vasco di Gama had reached the Cape of Good Hope he had lost fifty-five of his small crew. Magellan at Cape Horn had already twenty-one dead and thirty sick. Of Tourison's three ships one was abandoned, one barely crawled home with the remnant of the two crews, and the third might be said to have simply died at sea, from scurvy.

A voyage from Lisbon to Goa, with St. Francis Xavier as chief nurse and comforter, took 203 days, not on account of adverse winds but that:

> By reason of the long navigation and the want of food and water, they fell into sundry diseases. Their gums waxed great and swelled and they were feign to cut them away. Their legs swelled, and all the body became sore and so benumbed that they could not stir hand nor foot, and so they died for weakness. Though we had more than one hundred and fifty sick there died not past seven and twenty, which loss they deemed *not much*.

Three months after Drake had set out for booty in 1585 with 2300 men he had lost nearly three hundred; in the whole voyage, "there died five hundred and sixty," or 22 per cent of the crews. In Sir Walter Raleigh's colonizing voyage to Virginia two years later, provisions fell short, the water turned stinking, officers and men died, and they were "not only come home without any purchase but also in such weakness by sickness of their chiefest men that they were scarce able to bring their ship into harbour, but were forced to let fall anchor without." The Spanish Armada had not even left the ports of Spain before scurvy broke out, and people of their own seaboard towns shut their doors against the mariners. The English fleet, though nearer to home ports, suffered also. In the last voyage of Cavendish only sixteen survived out of seventy-six and "only five were able to move and work the ship and run her ashore." Since Hawkins' third voyage was in the slave trade perhaps he may be considered to have deserved what he got. He writes:

> If all the miseries and troublesome affairs of this sorrowful voyage should be perfectly and thoroughly written there should need a painful man with his pen, and as great a time as he had that wrote the lives and deaths of the martyrs . . . our men died continually and they that were left grew into such weakness that we were scarcely able to manage our ship.

No wonder that, old sea dog as he was, he concluded:

> It is the plague of the sea and the spoil of mariners . . . in twenty years since I have sailed the sea I dare take upon me to give account of ten thousand men consumed with this disease . . . the sea is natural for fishes and the land for men.

In the last voyage of Drake and Hawkins the enemy of the sailor got both these great admirals, also Captain Yorke, Captain Platt, Captain Jones, Captain Egerton, Captain Kendall, Chief Surgeon Ainswood, and five hundred others.

In 1740 Lord Anson adventured forth upon the favorite outdoor sport of that day, the spoiling of the Spaniard. Three years later he returned, his ships sailing deep with golden treasure—but at what a price! The Horn was rounded in a nightmare of storm and pestilence. Half a year out there were "not men enough to take in a topsail, all having scurvy, and six, eight and ten deaths a day." One year out, five hundred men of the principal ship were reduced to 213, and "four or five dead bodies at a time washing about the decks for want of help to bury them in the sea." By the time Juan Fernandez was reached, this ship, the *Centurion*, could muster only two quartermasters and six foremast men capable of trimming sails, so was barely able to make the harbor, "the ship being extremely loathsome between decks." The second ship, *Gloucester*, on reaching the Islands, had already thrown overboard two-thirds of her complement; not a man on board was in health; of those still alive scarcely one was capable of doing any duty, and even with help from the other ship she had to wait a month for a favorable wind to blow her into harbor. Their decks were "most intolerably loathsome." They who would rule the sea must first conquer scurvy.

But thirty years after Anson, Captain Cook on his second voyage was away from England three years "in which time under all changes of climate he lost not one man from disease." He sailed back, one of the world's great discoverers, having found new islands and lands, and having cleared up the big geographical question of his day, the supposed existence of a Southern continent, but with no doubt whatever in his own mind that his greatest discovery was how to sail the sea with some degree of safety from disease. He reported to the Admiralty that:

> Whatever may be the public judgment about other matters, . . . our having discovered the possibility of preserving health among a numerous ship's company, for such a length of time, in such varieties of climate, and amidst such continued hardships and fatigues, will make this voyage remarkable in the opinion of every benevolent person, when the disputes about a Southern continent shall have ceased to engage the attention, and to divide the judgment, of philosophers.

A few years later, partly as a result of this voyage, Britain provided limes and lemons for the navy, thus practically putting an end to scurvy, and remained mistress of the seas.

It was not only discovery and exploration, but colonization, the "swarming process" of races, that was hard hit by diseases, especially scurvy. All Jacques Cartier's men were ill, and twenty-five died, in the first winter at Quebec. Roberval lost fifty out of two hundred. A company wintering in Newfoundland in 1611 thought four deaths only, out of thirty-nine, a very good record, and recalled a colony that in two years had lost thirty-two out of forty. Champlain in one winter lost forty and had forty ill besides. About the same time sixty Virginia colonists died out of three hundred and fifty. Captain James' crew was nearly wiped out in a winter at James' Bay. Jens Munck sailed with two ships' crews into Churchill harbor in the Hudson's Bay in the fall of 1619. He and two others, the only survivors, sailed the smaller ship back to Denmark next spring. In 1586 Cavendish picked up near the Horn twenty-three Spaniards, all that were left of a colony of four hundred. In 1626, five hundred and thirty-two people from France set out to colonize the Barbadoes. "Most of the people died on the passage out," in one ship four out of five. In an English ship about the same time twenty escaped sickness out of two hundred. The Barbadoes colony a little later, probably from yellow fever, lost six thousand people, and the survivors could scarcely bury the dead. Oliver Cromwell's attempt to colonize Jamaica cost the lives of five thousand British soldiers out of seven thousand. In the slave trade it was considered a fair proportion to bring two hundred to the market out of a cargo of seven hundred. The Mayflower had scarcely sailed back to England before smallpox swept through the settlements and out among the Indians and only a few years later a fast was proclaimed among the people of Massachusetts on account of the mortality. In 1699 "arrived the Britannia from Liverpool which had been thirteen weeks in her passage. She had two hundred passengers on board, had lost fifty by death, and others were sick."

In 1698 twelve hundred set sail to establish at Darien "a general emporium for the commerce of all the nations of the world." A year later, "of those who had taken part in the enterprise only a miserable handful reached their native land."

Such were some of the horrors of seafaring while scurvy cursed the sea. It needs no argument to show that all world movements, all the come and go of peoples, all venturing into new waters, all long voyages, all discoveries, explorations, colonizations, the swarming impulse—the peopling of new lands from the old, all looking toward the unknown, all trade or conquest between old lands and new, or between old lands and old, or between colony and colony, all adventures whatever by ships and shipping, were held back by such a black scourge of sailor men. Scurvy while it blasted the sea held back the progress of mankind profoundly, and the conquest of this evil released immense new forces that changed the whole history of the race. This disease, then, and the conquest of this disease, were tremendous shapers of human history. Yet what world historian ever wrote a chapter or a paragraph on scurvy as a maker of history?

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BEGINNINGS OF THE CONQUEST OF DISEASE

This has been a long story of the spread and devastation of disease. What about the healing or the prevention of disease? When did these beneficent works begin? Even primitive man slowly learned from his mistakes, and as time went on the beginnings of some knowledge of health preservation emerged gradually out of the chaos of fate and witchcraft.

Among the Hebrews and Babylonians the laws of health were backed up by religion. Health was a cult. Ceremonial cleanliness was not only next to godliness: it was godliness. Behind the health laws of Moses, as behind the moral law thundered from Sinai was a "Thus saith the Lord." The ritual killing of animals for food is the beginning of modern meat inspection. The ritual of cleanliness prepares for the ritual of modern aseptic surgery, which is simply extreme cleanliness against dirt invisible as against dirt visible.

Certain animals the Hebrews might eat, others were unclean. If a man should touch an unclean animal, or a dead body, or the carcass of an animal that had died of disease, he must wash his body and his clothes, and be unclean until evening. Glazed vessels which became unclean could be cleansed by washing: unglazed vessels if polluted must be broken. If there was any discharge from a wound he who had it and he who touched it were unclean. That surely anticipated the laws of Pasteur and Lister. Sanitation was not mere community regulation; it was divine law. Every camp regulation must be observed to the uttermost not to be ready for the inspection even of Moses, but because: "The Lord thy God walketh in the midst of thy camp to deliver thee and to give up thine enemies before thee; therefore shall thy camp be holy, that he see no unclean thing in thee, and turn away from thee." It was a search for evils insanitary as well as evils immoral. Ideas of moral cleanness and physical cleanness were interchangeable. Sin was sickness; sickness was sin. Cleanliness was righteous: righteousness was cleanliness. Sin was uncleanness: uncleanness was sin. The whole head of the nation was sometimes said to be sick, and the whole heart faint. Moral restoration was a process of cleansing and healing. Health and holiness were two sides of one idea. And it is of interest to note that "heal" and "hale" and "health," "whole" and "wholesome" and "holy" are all cousin words derived from one Saxon root.

Perhaps the greatest gift of the Hebrews was the idea of the Sabbath, or rest day, a hygienic blessing to the world. Had they given nothing more to mankind they would still be among the greatest benefactors of humanity.

Another big idea that grew up among the Hebrews and was taught at Sinai was the idea that disease may be spread by contact, and therefore should be dealt with by isolation. In the Books of Moses leprosy is described as in a medical textbook. The priest was the diagnostician. The leper was made unclean, and an outcast. As he tapped his bell or clapper; crossed the road, and cried "Unclean! unclean!" he is one of the most pathetic figures of all the ancient days. The sad state of the leper seized the imagination of the people. In time the leprosy of the East was spread throughout Europe, partly, no doubt, by thousands of returning Crusaders. There were more leper houses in the small England of the fifteenth century than there are sanatoria in the big England of today. The teaching of the East about lepers and leprosy came to Western Europe with the religions of the Bible. The speculative East to this day has its lepers and leprosy. The more practical West took the methods of the speculative East, put them into effect, and cleaned up the disease in a century or two.

To the Hebrews, health was holiness; to the Greeks, beauty; and to the Romans, efficiency. But early Christianity was clouded over with an oriental asceticism. It threw the body, so to speak, into the discard. The body was a snare, an enemy. Neglect and contempt were not enough; it must be kept under by fasts and penances; it must be scourged, and even crucified. Hermits and anchorites, living in holes and caves, or on the tops of pillars, made a virtue of suffering and primitivism, and, indeed, of filth. Even with the best of these saints and holy men, cleanliness was, to say the least, no part of godliness. "In seeking a heavenly home, man lost his bearings upon earth."

So we have to wait almost until our own day for a gradual development of ideas of cleanliness comparable with those of the laws of Moses, or for standards of health and beauty like those of the Greeks, or for sanitation such as that of Imperial Rome. The marvels of the modern bathroom belong to the later nineteenth century. The historian Lecky considered that the greatest triumph of the century of the steam engine was the water carriage of sewage. It was the same century or half-century that developed the full-time health officer, slumbering not nor sleeping, skilled not so much in the curing of disease as in preventing it.

The medical science of yesterday at its best, we see in Luke Fildes' "Doctor," the worn-out mother in tears, the grim-faced father, the kindly earnest doctor, leaning over, watching every fluttering breath of the pale little girl battling with death. The medical science of tomorrow we see in Jenner vaccinating his own child against smallpox. Today is neither yesterday nor tomorrow, but both. Prevention is better than cure. Even today we can see that the great triumphs of medical science are to be in disease prevention. Within one lifetime the causes have been found of tuberculosis, diphtheria, malaria, yellow fever, typhoid, typhus, scarlet fever, rabies, tetanus, hookworm, plague and many other scourges. Some of these are practically conquered in civilized countries. Yellow fever is almost as extinct as the dodo. Typhoid fever runs parallel with municipal inefficiency. Tuberculosis death rates have been cut in two twice over in the past two generations.

LATER VICTORIES

And the conquest of disease by wholesale has barely begun. If we were to glance once more backward and forward, which of all diseases would we choose as having been most dramatic in its entrances upon the stage of world history, and likely to be even more dramatic in its exits? You may be surprised if the choice should fall upon malaria. As Osler says:

> It is difficult to draw comparisons in pathology, but I think if a census were taken among the world's workers in disease, the judgment to be based on damage to health and direct mortality, the votes would be given to malaria as the greatest single destroyer of the human race. . . . Cholera kills its thousands, plague in its bad years its hundreds of thousands, yellow fever, hookworm disease, pneumonia, tuberculosis, all are terribly destructive, some only in the tropics, others in more temperate regions; but malaria is today as it ever was, a disease to which the word "pandemic" is especially applicable. In America and in Europe its ravages have lessened enormously during the past century, but in the tropics it is everywhere and always present, the greatest single foe of the white man, and at times and places it assumes the proportions of a terrible epidemic.

A belt around the globe at its middle, six thousand miles wide, three thousand above and three thousand below the equator, takes in half the land of the world—and the best-watered and most fertile of it—and half the people of the world. Here were the cradles of the race. Why does not this belt still dominate the race? Why have the stars of empire moved northward in their courses? Simply because this equatorial area lies prostrate under the curse of tropical disease, especially malaria. Roughly, one-third of these populations have malaria each year. It kills—indeed is the greatest killer of the human race—but worse almost, it leaves millions of those who do not die of it chronically ill, benumbed, dulled, depressed, their lives sapped and shortened.

> The hopeless millions die
> That yet have never lived. *Ronald Ross*

In a year India loses one and one-third millions of people from malaria. Year by year it sends to hospital one-third of the Indian army. The economic loss from malaria in the State of Georgia equals a yearly tax of fourteen dollars per acre on all tilled land. If the whole of Canada and the United States were as malaria-stricken as some of the countries of southern Europe, forty-six millions of their one hundred and twenty millions would have malaria at some time in their lives, a quarter of a million people yearly would die of it, all enterprise would be blighted, the economic loss yearly would be greater than that of the Great War, and the moral loss would be unthinkable. The two nations would lie ruined.

And most tragic of all the entrances of malaria upon the stage of history! Why did Greece fall? A land of heroes, superb physical creatures, supreme in art and literature, in science and architecture and philosophy,—how could she fall in a few centuries to be a land of slaves? Eternal summer gilds them yet, those Isles of Greece, but all, except their sun, is set. All that is left, "for Greeks a blush, for Greeks a tear."

The causes, we can well believe, were complex, but modern researches lead more and more to the conclusion that the chief, perhaps the single cause was the invasion of Greece by malaria. In early Greece there was little or no malaria. About four centuries before Christ it began to be well established, as shows clearly in both the medical and the non-medical literature of the time. This from the father of Medicine, Hippocrates: "Those who live in low hot moist districts, and drink the stagnant water, of necessity suffer from enlarged spleen. They are stunted and ill-shaped, fleshy and dark, bilious rather than phlegmatic. Their nature is to be cowardly and to avoid hardships." And Sophocles: "Blighted are the fruits of the earth; blighted the herds of cattle, and the barren pangs of women. Withal the fever-god swooping down, a dreadful plague, is ravaging the city."

Exactly corresponding to this increase in malarial disease W. H. S. Jones of the University of Manchester shows that:

> A subtle but unmistakable change came over the Greek character after the fifth, and to a greater degree after the fourth century, before Christ. Gradually the Greeks lost their brilliance, which had been as the bright freshness of early youth. This is painfully obvious in their literature if not in other forms of art. Their initiative vanished; they ceased to create, and began to comment. Patriotism, with rare exceptions, became an empty name, for few had the high spirit and energy to translate into action man's duty to the state. Vacillation, indecision, fitful outbursts of unhealthy activity followed by cowardly depression, selfish cruelty and criminal weakness, are characteristic of the public life of Greece from the struggle with Macedonia to the final conquest by the arms of Rome. No one can fail to be struck by the marked difference between the period from Marathon to the Peloponnesian war, and the period from Alexander to Mummius. Philosophy also suffered and became deeply pessimistic even in the hands of its best and noblest exponents.

What Greece became, and what Greece still is, we may know in the words of a modern Greek, who writes with many mingled metaphors:

> Malaria is the sword of Damocles hanging over our heads. It chokes the rising generation, drains the strength of the adults, lays waste our fields and weakens the arms of our warriors. These malarial fevers are crushing the nation body and soul and fostering among us idleness and all the evils that spring from idleness. Breathing their poisonous breath upon the face of the Greek land they shorten by one-half the life of the nation and like harpies defile all that they cannot devour or snatch away.

The blight of malaria that fell upon Greece fell also upon Rome, and proof is not lacking that among the various elements in the fall of Rome, it had a considerable part. "In five centuries the Pontine district was converted from a fertile land, so thickly populated with a warlike people as to excite the wonder of the historian, into a dreary marsh with few inhabitants and more or less unhealthy."

Just thirty years ago the real villain of this world tragedy of malaria was dragged by the hero to the footlights. The villain was a small dappled brown mosquito, one of the anopheles. Seven hundred and ninety-nine known kinds of mosquitoes digest the malaria parasite when they make a meal of malarial blood, but this fateful eight hundredth passes it along undigested to other victims. The mosquito itself is not diseased; he is simply a common carrier. What he gets from A. he passes along to B. and C. and D., and all the rest of the alphabet. In many parts of the world this anopheles did no harm for centuries. But when people returned from travel, or soldiers returned from campaigns, with malarial parasites in their blood, the mosquitoes fed on them, and spread their infection to many others. In this way parts of England were re-infected with malaria following the Great War. Malaria was unknown in Mauritius until in 1866 malarial people came from India. The mosquitoes thus got access to the parasites, malaria spread like an epidemic, killed one in six of the population and depressed the life of the whole island.

The hero was Ronald Ross, an army surgeon of India, who followed the villain as Sir Galahad followed the Holy Grail, both alike for the saving of a race. Utterly discouraged by repeated failures he wrote, "I will watch and pray and try a few more experiments." In a few days came triumph, and he could say, or sing, for this scientist was a poet also:

I have found thy secret deeds
Thou million-murdering death.

The rest would seem to be easy. Since the anopheles carries the parasite from a malarial man to make other men malarial, why not simply isolate malarial men from mosquitoes, or kill off the mosquitoes, or better still, do both. Screen houses, drain marshes, fill up pools, cover cisterns, spread a film of oil over ponds, let no breeding place remain. Very simple, but it will be decades and generations and perhaps centuries before this simple idea spreads in practical measures throughout the whole tropical belt.

But nevertheless, malaria is conquered and its companion disease yellow fever also mosquito-carried, utterly routed and almost annihilated. One local conquest of these diseases was a part of that modern miracle, "the greatest liberty man has ever taken with nature," the Panama Canal. The French could not dig the canal because they lost fifty thousand lives, two hundred and forty out of every thousand men employed. The Americans could dig the canal, and did dig it, because they made the canal zone as healthy as New York, and lost only eight out of every thousand men.

The canal is equally a triumph of medical science and of engineering. And so all the consequences that follow upon the canal, Columbus' dream come true after four hundred years, the meeting of West with East, the world's learning to think and trade Pacific-ally as well as Atlantic-ally—all these follow in great part upon the long perservering unpaid labors of a much discouraged army surgeon in India. Is this not history in the making? Will this not continue to make history while the world endures?

The American army surgeon Gorgas who had most to do with cleaning up the Canal Zone indulged in a prophetic view of the historical consequences:

> Any population coming into the tropics can protect itself against malaria and yellow fever by measures both simple and inexpensive. With these two diseases eliminated, life in the tropics for the Anglo-Saxon will be more healthful than in the temperate zones, and gradually within the next two or three centuries tropical countries, which offer a much greater return for man's labors than the temperate zones, will be settled by the white races, and again the centres of wealth, civilization and population will be in the tropics, as they were in the dawn of human history.

Optimistic, perhaps, but look at Florida! Medical science has conquered malaria. When states and governments begin to conquer it, the greatest revolution in the history of the race will have begun. Every gain in theoretical science opens up a vista in applied science; every conquest of disease opens up a vista in the history of man.

I began this discussion with the thesis that historians had shown little appreciation of the tremendous history-forming forces of disease and the conquest of disease. The reason is not far to seek. It is only in the past two generations that the definite causes of many diseases have emerged from a general haze of etiological and theological conjecture. Scientific historians have scarcely had time to make the necessary adjustments in their thinking or to recognize the causes and effects of disease in the warp and woof of history. As long as diseases were looked upon as falling haphazard from the skies, or as controlled by fates that were inscrutable, scientific history could make little of them. But when every disease and every epidemic is known to be absolutely the effect of exact causes that may be enquired about and better and better understood; and when the effects of the phenomena of disease and the conquest of disease are also becoming more ascertainable and calculable, a new and intensely illuminating aspect of human history is opened up for study. I have tried to show that the sixty centuries of civilization have employed themselves, first, in increasing and internationalizing diseases, and then in learning how to partly control them. I have shown how travel and trade and war have been the greatest spreaders of disease, how disease has hurled down empires. I have shown also that disease may be conquered, even dramatically, with consequences to nations and the race we scarcely dare to prophesy.

It may be that with our science and many discoveries, with new skill in healing, and new knowledge of preventing disease, we may be getting the race into new difficulties. Old death rates have passed away and all death rates have become new. Ten years have been added to the average life-span in the last quarter century. Insurance companies are piling up profits and surpluses because people put off longer and longer the necessity of dying. Populations are increasing, and employment for them apparently decreasing, in a way to raise up a new Malthus to prophesy evil. Will the submerged populations of the tropics be restored to health and vigor only to overwhelm the rest of us? Are there already too many of us everywhere? If overcrowding should come in the near or far future, it will be just one more evidence of the immense and far-reaching influence upon the history of the race of Disease and the Conquest of Disease.

GALILEO GALILEI

By LEOPOLD VACCARO, M.D.

PHILADELPHIA

GALILEO GALILEI was born in Pisa on February 15, 1564, three days after the death of Michael Angelo, and died on January 8, 1642, the same year that Newton was born. The year following his death Torricelli, his faithful pupil, discovered the barometer.

Italy was then the most cultured community of the world. Latin and Greek were generally mastered and the vernacular language was correctly and elegantly spoken and written by the cultured men. In this century lived Andrea Cesalpino, Paolo Sarpi, Giordano Bruno and Tommaso Campanella. The diffusion of culture was visible in all parts of Italy. Not only the social and historical sciences had advanced, but the exact and natural sciences under the dominating influences of Galileo had made remarkable strides. The discovery of America and the abundance of gold gave occasion to the writing of numerous works on political economy and jurisprudence.

Whoever watched Italy could not help calling her a happy land. Wars and revolutions had forsaken her. There was peace, tranquillity and rest for the mind. England boasted of Cromwell, but she had Masaniello. Europe moved without her and outside of her pale among wars and revolutions which were shaping and accelerating a new civilization. She was lying blessed in that idyllic leisure which was the inspiration and Muse of her poets. Out of the wars of Germany sprung political liberty. From the civil wars of France gushed the powerful French unity.

It was during this period that the most abstract questions were arousing and inflaming the minds of the multitudes. From this clashing of ideas new problems and new solutions were born. It was a general fermentation of ideas and of things. What was fermenting in the solitary brains of the great religious reformers, Bruno and Campanella, was crystallized in Galileo and the Modern World was breaking away from all the mystic and scholastic elements, from all prejudices, and asserting itself on a solid basis. Therefore, Galileo was the real father of the Modern World.

The method which Galileo applied to the new natural sciences became the universal and absolute method, the path of truth in all of its applications. Induction chased away syllogism and experiment put to flight the supernatural. Tradition and authority were thus doomed. Galileo constructed a New World on facts and facts alone.

These current ideas were not new in Italy. Macchiavelli and his admirable "Metodo" had attempted to put aside the scholastic concepts, but under Galileo these ideas are properly relocated, detached, brought in bold relief, formulated with clarity and energy so that they appeared a real revelation. Humanity was entering in the bosom of nature and becoming a part of the natural history. She was abandoning the World of abstraction and entering upon the serious study of man and nature, the study of realities.

Galileo blazed the logical path from which came forth the great advancement of positive sciences.

Galileo's father, Vincenzo, was poor but of noble birth. He left Florence for Pisa where he taught music and played several instruments. He was married to Giulia Ammannati, a noble woman of Brescia, in July 1562. Galileo was born two years after this union. The first years of Galileo's life were none too happy with a mother that was none too tender for him. His father was frequently absent, his work often taking him to Florence. He learned the rudiments of grammar from a poor, but pedantic priest. While he was being taught abstract syntax, his mind was on games and toys. He derived great pleasure from toys that resembled instruments and machines.

At the age of ten, Galileo was brought to Florence by his family where his education was carried out. The child showed extraordinary aptitude and talent for music. Soon after, he had to study the "humanities" from a mediocre teacher, but this meant nothing to a prodigy with a positive mind. Cicero, Ovid and Virgil made no impression upon his mind. He soon relinquished the Latin classics and became absorbed in the works of Dante, Petrarch and Boccaccio, who were disdained by the pedants.

He was next sent to the school of the Benedictines at Vallombroso near Florence, where he had to learn Logic and Scholasticism. The religious influence of this environment was such that he had almost entered that order had not his father dissuaded him. Galileo owed much to his father, such as the knowledge of drawing and of music. Florentine nobility learned these arts as a matter of course. Galileo's father, who was in rather poor financial circumstances, definitely decided to make a physician of his son. The profession was then both honorable and lucrative, particularly adapted to the boy's passion for observation. Therefore, he decided to send him to the University of Pisa under the vigilant care of a relative residing in Pisa.

He reached Pisa in September, 1581. He had two worthy masters, Andrea Cesalpino, the first to recognize the sex in flowers and by some authorities recognized as the discoverer of the circulation of the blood. The other teacher was Francesco Buonamici, professor of philosophy. The teaching of philosophy then comprised such sciences as physics, biology, cosmography and astronomy. The teaching was entirely based on Aristotle's works which had been accepted by the Church as the basis of scholasticism.

These studies proved very tedious to Galileo. Inasmuch as they excluded free discussion and the expression of individual ideas, was it worth while for him to waste his father's allowance on out-of-date commentaries which dulled his brain and repressed his powers of observation? He hated to accept blind statements. He wanted rigorous demonstrations, experimental proofs. Almost providentially something happened which changed the whole career of Galileo.

The court of Florence was transferred to Pisa for a short period. Ostilio Ricci, a friend of Galileo's father, also came to Pisa as the Grand Duke's mathematician and soon a warm friendship between the two was established. Ricci was amazed at the boldness and accuracy of this boy's reasoning and loved him for it. Ricci had asked him who had taught him along these lines, and the boy confided to him the bitter disappointment of not having had a worthy teacher, capable of teaching him geometry and mathematics, which he considered as the foundation of harmony and design.

Ricci saw in the scholar the scientist in the making, devoted to mathematics which alone was capable of satisfying his passion for precision and creative thought, but he also realized the financial difficulties of Galileo's father, and would not assume the responsibility of advising the boy to carry out his life ambitions. Galileo's father was, therefore, consulted and no obstacles were placed in his path, provided he would not give up the study of medicine.

Galileo soon plunged himself into the world of Euclid and Archimedes, neglecting medicine and Aristotle. His father became aware of it and reproached him severely. Galileo studied his preferred subjects, secretly hiding his theorems under the works of Hippocrates and Galen. Ricci, fearing to compromise himself with Galileo's father, abandoned the prodigy to his destiny.

The study of Archimedes exercised a profound influence on Galileo. Instead of attending his lectures at the University he was walking through streets of Pisa and the surrounding country, in deep meditation.

One day while worshipping in the Cathedral, he noticed that the janitor, after feeding an oil lamp, had left it swinging. This commonplace occurrence, which had passed unobserved by all the preceding generations, revealed to him a rhythm, a regularity in its going and coming, showing that the halves of the semicircle involved in its motion were covered in equal time, in spite of the progressive slackening of its activity. Great or small, were the oscillations of the lamp really taking place in the same period of time? This observation seemed to him miraculous. He rushed home to prove by experiment what he had seen and discovered.

This discovery Galileo immediately applied to the medical field, such as the counting of the pulse, and later on, the measurement of time, and to his astronomical studies, to forecast eclipse and other celestial phenomena.

He had now reached the age of twenty and was astonishing his teachers by his practical observations, in lieu of abstract propositions. He considered the science of mathematics as the language of nature, and the application of numerical relations to his observations, as the ultimate way to determine the laws of the universe. His views were communicated to the best mathematicians of the century, who complimented him. His fame grew rapidly.

Leaving Pisa, without graduating as a physician, he obtained a position as lecturer on mathematics at Siena. At the same time he gave lessons to a few noblemen on Dante. But he saw no future for himself and longed for a position at the University of Pisa or the University of Florence. At the same time he realized his extreme youth for these positions. He appealed to the celebrated mathematicians, with whom he had corresponded, and finally succeeded in obtaining a recommendation from Cardinal Carmerlingue for the University of Bologna, but the effort was futile. He was, however, appointed to the chair of Mathematics at the University of Pisa at 60 florins a year. This was the equivalent of five dollars a month in the United States. In order to live he had to give private lessons and probably practiced medicine, although it is not definitely known whether he graduated as a doctor, and how good a doctor he was. We know that he had sent for his treatise by Galen which he had left behind.

Galileo's stay at the University of Pisa with his innovations and original conclusions had aroused the jealousy of his fellow professors, who differed from him on his teachings on the laws of movement and gravity opposed to Aristotle's accepted theories. Galileo proved his point by throwing two balls, one big and one small, from the leaning tower, both reaching the pavement simultaneously, before a delegation of Doctors, wearing long velvet robes, and other citizens.

In 1591 he had the misfortune of losing his father and had to return to Florence where he had considerable financial difficulties. In 1592 he was invited by his friend and protector Del Monte to Venice, through whose influence the Doge of Venice recommended him to the Rector of Padua to fill the Chair of Mathematics.

At Venice Galileo became very friendly with Paolo Sarpi, who was a friend and co-worker of William Harvey. He also became acquainted with a future Pope, Cardinal Borghese, who later became Pope Paul v, and Donato, Doge of Venice, and established a warm friendship with the Venetian Ambassador Sagredo at the home of Morosini which was the rendevous of intellectuals. He met many illustrious characters that played an important part in the tragedy of his life.

The first lecture of Galileo at the University of Padua was delivered on December 7, 1592, establishing a standard for a chair which had remained vacant for two years for want of a worthy professor. The scholastic concept of the universe at that time was a series of interlocked spheres on top of which was the high heaven; then came the crystalline spheres of fixed stars and then the planets. In the center of the universe was our World and all the celestial spheres revolved around it, in twenty-four hours.

Tommaso Campanella had written a treatise entitled "De Sphaera Aristarchi" where he advanced the Copernican theory of the motility of the earth. Before Copernicus, two illustrious Italians, Filolao and Timeo had promulgated the hypothesis of the motility of the earth. Campanella begged Galileo to reform astronomy, but Galileo, who also had his own hypothesis, would not commit himself without first proving his own propositions by experiment. It was a conflict between the Florentine culture, which was mature and truly positive, and the culture of the South, which was speculative.

The Polish monk Copernicus, who had been a pupil at Padua, and had learned the theories of Filolao and Timeo, had a different concept of nature. He advanced the hypothesis of the rotation of the earth on its own axis in twenty-four hours, and around the sun in one year. This was a simple hypothesis and had been accepted by the Church as a truly and purely mathematical proposition, not contrary to the Scriptures. Copernicus died a few days after the publication of his book. Nobody paid any particular attention to this theory except

Giordano Bruno, the greatest philosopher of the Italian Renaissance.

Galileo was deeply influenced by Bruno's writings. For many years Bruno led an errant life in foreign countries under strong suspicion of the Inquisition. He demonstrated the scientific and philosophic consequences arising out of that system, explaining that the earth was not the center of the universe and stationary, as was then believed, but a planet revolving around the sun; that there were innumerable worlds, each independent and probably inhabited like our earth. He maintained that the Bible should not intervene in questions of Nature. The Inquisition finally laid its clutches upon Bruno and burned him alive in Rome. Campanella's incarceration for many years, and Bruno's fate, must have made Galileo ponder most seriously before daring to lay the foundations of a science that would run counter to the interests of the Church. At heart he shared Bruno's opinion, but he still taught the old-fashioned astronomy, though he scorned it. Galileo accepted Bruno's hypothesis, but before officially sponsoring it, he wanted to prove it by rigorous experimental demonstrations. He was the first great scientist of the new era and would not be carried away by the brilliant imaginations of great philosophers. He deplored the interference of the Church in the realm of science.

While the Inquisition was vigorously prosecuting and suppressing the advanced thinkers of the Renaissance in the various sections of Italy, the Venetian Republic would not tolerate any interference by the Church in matters secular. For this reason, on many occasions, the Doge went on record in defense of foreign students against the Bishop of Padua. A new sect, the Jesuit fathers, had emerged within the Church, whose main object was to combat any movement that savored of religious reform and might undermine the existence of the Church. These fathers had settled in Padua, and had founded a school on lines quite similar to the University of Padua, giving rise to many clashes between the students of the University and their own. The Venetian Republic often intervened and ruled in favor of the lay students, in open defiance to the Vatican. Galileo was a very pious Catholic, but his sympathies, as already shown, were for free discussion and investigation, without restriction. The salary paid Galileo at Padua was insufficient for his personal needs. As a side line, he taught military architecture to princes and nobles, especially those who intended to follow a military career.

At this time Galileo invented a compass constructed with four branches, each graduated, which served to divide lines in equal parts, to change the scale of figures, and to determine the relationship of equivalent bodies. This instrument was quite complicated, and required special instruction, and was the means of procuring additional students to the great master. Galileo's fame grew rapidly; celebrities from all over the world were anxious to meet him and pay him homage.

In addition to his own expenses, Galileo had to bear the burden of his family and furnish a dowry for the marriage of his sister, which he was not able to fully pay until later on in life, a matter causing him many heartaches. In 1599 the Venetian Senate voted for the renewal of his contract with an increase of 140 florins. He was now afflicted with articular rheumatism and was under the care of one of his many friends, Fabricius of Acquapendente, the famous anatomist of Padua, teacher of William Harvey, who prescribed pills of aloes, which were carefully prepared by Galileo himself to save money.

Galileo probably thought as Cicero, that no man can devote himself to a wife and Science; therefore, he never legally married. During the spare hours Galileo revelled in the field of mechanics, and constructed a machine capable of raising water for the irrigation of the soil. In 1593 he applied for a copyright from the Government of Venice. He associated himself with the great literati of Padua, who met at the house of Pinelli, where questions of philosophy, science and literature were discussed by those, who were versatile in all matters; so characteristic of the intellectuals of this age.

In December, 1602 the Venetian Ambassador left for London and Sagredo, Galileo's friend, took advantage of the opportunity to communicate with William Gilbert, an Englishman, who had just published a remarkable work on the "Magnet." Galileo, realizing the great worth of the English philosopher, added a few words of appreciation. Soon after, Sagredo acquired a magnet and was carrying on experiments of his own. He loaned it to Galileo, who succeeded in multiplying the power of the magnet by means of armatures and by winding steel threads around the poles. He made numerous observations which were communicated to Sagredo and Sarpi. While playing with the magnet Sagredo was approached by a compatriot who tried to sell him the secret of distant conversation by means of the "sympathy of magnetized needles." He treated him as a charlatan and disposed of him quickly. Later centuries proved that this was the basic principle of telegraphy. What a revolution it might have caused then if this obscure inventor had received due recognition!

Besides being a scientist and a philosopher, Galileo wrote several burlesque comedies to occupy his leisure hours and participated in the traditional ceremonies of the University.

Under the protection of the winged lion of San Marco which symbolized the force and right of the Venetian Republic, numerous German Lutherans and so-called heretics from other nations flocked to Padua and were never molested.

The populace of Padua was still fettered by superstition. In 1604 a new star made its appearance; the public interpreted it as an ominous sign, possibly a war, an epidemic or some other calamity. The magicians and the astrologers gave their interpretations. The Aristotelians, who held steadfast to the belief that the number of stars was fixed since their creation, were panic stricken and deduced that the new star must have been an illusion.

Galileo was one of the very first to observe this new apparition and, in response to public demand, he delivered three brilliant lectures in explanation thereof. The theories advanced by Galileo caused a rupture with the Peripatetics of Padua, especially with Cremonino, who was considered as the genius of Aristotle. Galileo answered his opponents under an assumed name with a dialogue, written in Paduan dialect.

A student of medicine, by name Capra, who had attended the three lectures given by Galileo, in order to further embarrass him, accused the great scientist of plagiarism. Galileo ignored Capra, but his silence meant defeat. Another man of the same stamp of Capra, Ludovico Delle Colombe, took upon himself to attack the dialogue written by Galileo. This affair, while comic, was the cause of great suffering for the scientist in the end. It was the starting point of a definite rupture between the Aristotelians, who, in connivance with the theologians, were seeking to condemn the great philosopher and astronomer and with him annihilate all Modern Science.

Galileo's exact conclusions on the new star created great enthusiasm, throughout the rest of Italy, notwithstanding the hostility shown him in Padua. The Grand Duke of Tuscany and the Florentines were longing to have the famous scientist back in his native land. They were devoted patriots and were loath to have other Republics capitalize their native genius. In the meantime, Giugni, who had been a pupil of Galileo and was the son of the Grand Chamberlain of the Tuscan Court, had returned and had spoken to the Grand Duchess Christina about Galileo. She thereupon invited Galileo to spend a few weeks at her summer residence, offering him a good room, a seat at her table and a most cordial welcome. The young Prince Cosimo was also greatly delighted to entertain him.

In 1606 Galileo went to Venice to obtain permission to print his book on the geometric compass. The city was in an uproar. Pope Paul v had excommunicated the Venetians and the Jesuits were doing all in their power to engender disobedience and disorder. On his return to Padua he had received permission for the publication of his book and a raise in salary of 200 florins, making it in all 500 florins. The book was dedicated to Cosimo De'Medici and was entitled "Operations of the Geometric and Military Compass."

Galileo made frequent visits to Florence, especially at Morosini's house, where the illustrious men of the city gathered. He probably heard there that in Flanders an optician had presented to Count Maurice of Nassau an instrument that magnified distant objects. Some gave credence to this news, others were skeptical, but Galileo's mind was inspired by this fantastic invention. Galileo, knowing the laws of optics and geometry, conceived that to obtain magnification, it was necessary to have a concave and convex lens. As soon as he had understood the principle of the magnifying glass, he reconstructed the accidental discovery of the Dutch optician. With mathematical precision he calculated the curve of the lenses that would give the greatest magnification of distant objects. Once he had perfected the theory of the apparatus he had only to perfect the material and obtain the best lenses and most suitable tubes to hold them together. He had thus discovered the telescope which opened the path to infinite scientific progress.

The enthusiasm of the Venetians reached the zenith and Galileo was summoned to the Ducal Palace. In the presence of Doge Leonardo Donato and members of the Senate he demonstrated his epochal instrument.

He was appointed professor for life with an increase in stipend.

In an age in which manual work was not shunned by thinkers Galileo spent many tedious nights in manufacturing and improving the lenses of his telescope, until he had constructed an instrument which magnified an object 32,000 times. He turned this powerful instrument toward the heavens. This was in the year 1610, a memorable date, which definitely divides the past from the present.

Galileo was the creator of this new era. The experimental method was given to the World together with the exact formulae of laws that govern nature. With this powerful instrument, Galileo began his astronomic speculations which modified the Biblical and Ptolemaic systems. The facts that had been advanced as hypothesis by Bruno had now acquired absolute certainty. Galileo's "Siderius Nuncius" was as marvelous as the memorable voyage of Columbus. The mountains of the moon, the phases of Venus and Mars, the spots of the sun, the satellites of Jupiter were being discovered in rapid succession. Natural philosophy had won the last battle with public opinion. The facts were there and spoke louder than the syllogisms of the theologians and the scholastics. The "effectual things" of Machiavelli, the "natural luminary" of Bruno, the "experimental method" of Telesius, the "liberty acceptable to truth" by Campanella, had now been completely proved by Galileo. "Philosophy is written in the great book of nature," said Galileo. The "Siderius Nuncius" by Galileo revealed to the astonished world the science of astronomical facts and a positive knowledge of an infinite universe. It was dedicated to Cosimo II, and the four satellites of Jupiter discovered by him were named "Medicean" from the family of Medici. The astronomer, Kepler, gave his stamp of approval to the "Siderius Nuncius."

Galileo made no direct attack on the accepted religious beliefs of the time, as he had no inclination, as a pious Catholic, to enter into religious controversy, but his enemies, headed by Cremonino, began to show open hostility to the great scientist, discrediting the existence of the new stars as a pure fabrication. These enemies obstinately refused to look through the telescope, but were unsparing with criticism and sarcasm. The opposition, the wakeful nights, the endless correspondence soon affected the health of Galileo. He longed to return to his native Florence and devote the rest of his life in the service of science and his beloved city. Cosimo II appointed him Chief Mathematician to the University of Pisa and Chief Mathematician and Philosopher to his Highness.

Among the staunch friends of Galileo was the Benedictine Father Castelli, who by pure reason followed up the work of Copernicus, deducing the phases of Venus, thus originating the fundamental premises of scientific research, the hypothesis. He defended his friend with vigor and ability, but to no avail since the enemies were blind and deaf to the truth. The Jesuit Fathers of the Roman College had independently carried on experiments, under Father Clavio, and had confirmed the existence of the satellites of Jupiter, which Galileo had called the Medicean Planets, in honor of his Monarch and protector. This was a source of comfort and jubilation for Galileo who decided to journey to Rome, where he met Cardinal Maffeo Barberini and was received by Paul v. Princes and Cardinals begged him to be their guest. He was feted by the most exclusive Roman aristocracy to whom he demonstrated his telescope and his many heavenly discoveries. One prelate, however, stood apart—this was Cardinal Bellarmin of the Inquisition, who feared that the ideas of Galileo might eventually undermine the stability and security of the Church.

Returning to Florence after his great triumph in Rome, the Grand Duke gave a banquet in his honor, which was attended by Cardinal Maffeo Barberini, who later on became Pope Urban VIII, the deciding factor in the tragedy of Galileo later on. With the increasing host of friends, arose the enemies. The followers of Aristotle, whose philosophy was apparently based on the Bible, being in danger, were seeking the support of the State Religion. The greatest agitator against our scientist was Ludovico Delle Colombe who accused the followers of Galileo of teaching a doctrine, contrary to the Scriptures, which testified that the earth was immobile, in the center of the universe, with the sun revolving around it.

Delle Colombe pointed out the first rule of theology, which states that when the Bible can be literally interpreted, it should not be analyzed. This argument was injected to arouse the fanaticism of the Inquisition. Several priests fell in his trap and delivered sermons against the Galilean doctrines. Cardinal Bellarmin watched from Rome the development of what he considered pure heresy. It was this Cardinal who had condemned Giordano Bruno to be burned alive at the stake. An accuser arose in the person of Father Lorini, who preferred charges against Galileo for confirming the statement of Copernicus that the earth revolves and the sun remains immovable.

On February 25, 1615, Bellarmin assembled the members of the Holy Office to take account of Lorini's accusation and other errors in the meaning and interpretation of the Holy Scriptures. Galileo had numerous and able defenders and friends among the clergy, such as Monsignor Gianpoli.

To a priest who had pleaded the cause of Galileo, Cardinal Bellarmin replied as follows: "'The sun rises and sets and returns to its place,' said Solomon, who not only spoke as inspired by God, but was the wisest of all wise men who learned human sciences and in the knowledge of things created, and whose wisdom was given to him by God."

Galileo felt that he had to go to Rome to defend himself from the accusations of his enemies. On Friday, March 26, 1616 he appeared at the Palace of the Cardinal and in the presence of the Commissary of the Inquisition, he was informed of his errors and ordered in the name of the Pope and Holy See to reject them. He signed his renunciation brokenheartedly with death in his soul. He was disappointed by the setback that science and philosophical liberty had received after the brilliant discoveries he had made. He returned to Florence in July 1616, where his friends rejoiced at his safety, and settled in his villa at Bellosguardo in complete seclusion, devoting his time to the care of his garden. But his mind was not inactive.

He meditated on the principle of the expansion of fluids by heat and applied it to the reading of temperatures. It was another useful invention which we physicians use in our daily practice: the clinical thermometer. It was rather crude and consisted of a graduated glass tube, with an open end inverted on a receptacle of water. The opposite pole was closed and contained a globe of air. As the tube was heated it expanded the air and compressed the water and vice versa. Robert Fludd (1574–1637) announced this invention as his own in London without giving credit to Galileo.

It was also at this villa that he rendered another great service to medicine and science, by conceiving the microscope, which at the hands of Malpighi and Borelli was destined to revolutionize biology and pathology.

While secluded and disgusted with the insincerities of the Court life he applied himself to the determination of the exact position of the Medicean satellites. He developed a chart which had been considered impossible of accomplishment by both Kepler and Father Clavio.

At this period also he applied his calculations to the determination of longitudes which theretofore had been applied to lunar eclipses, the infrequency of which created great discrepancies in the existent marine charts. Since the Medicean satellites with their rapid movements around Jupiter, brought eclipses all year round, this Galilean discovery enabled navigators to estimate their positions more accurately and correct the charts already in use.

In the month of August, 1618 three comets appeared in the sky, creating great excitement in the populace. Father Grassi gave his theoretical interpretation. Galileo gave his version. He pointed out that comets had trajectories which distinguished them from the other heavenly bodies. Observing that the comets were transparent with the tails in opposite directions to the sun he ascribed their light to the reflection of the sun on vapors. He added that this was only a hypothesis and needed to be corroborated by experimental proof. Galileo's explanation did not harmonize with the interpretation of Father Grassi of the Jesuit Roman College. This helped to further arouse the antagonism of that sect.

Cardinal Barberini, one of the most cultured men of the age, who on many occasions had strenuously defended Galileo from his countless enemies, headed by Capra, Cremonini, Shreiner and others, was now created Pope and assumed the name of Urban VIII. Monsignor Gianpoli, another staunch friend of Galileo, was made Secret Chamberlain to the Pope. The future of science as laid out by the famous astronomer seemed auspicious.

The Accademia dei Lincei which was in possession of Galileo's manuscript "Il Saggiatore" had just published the book and had dedicated it to the new Pontiff. The Aristotelians, scholastics and Jesuits realized that this was not a propitious time to renew their attacks on their opponent who was the man of the hour. Much has been written about these bigots and their merciless vindictiveness. It constitutes one of the dark chapters in history which might as well be passed over, except that in striking at Galileo they were attempting to deal a mortal blow to science generally.

This persecution against the great and the wise was not a characteristic of the dominating Church. The Greeks had done the same thing with Socrates and the Calvinists with Servetus. In our own country we have not forgotten the persecution of the Quakers in Boston.

In the spring of 1664 Galileo left for Rome for an audience with the Pope. He was now sixty years of age. Urban VIII received him several times, conferring upon him unusual honors.

In the following year Galileo had put the finishing touches on his masterpiece "The Dialogue concerning two new Sciences" and applied for the Imprimatur or permission of Publication from the Holy See. The Pope was busily engaged in trying to halt the rising tide of Protestantism and disobedience to the Mother Church. He, therefore, assigned the task of examining the manuscript to Monsignor Gianpoli, who granted the permit of publication on the following conditions: The Copernican system was to be treated as a simple hypothesis; the proposed title Ebb and Flow should not be used; the Copernican system should be refuted at the end and a submission to the Church's decisions should be acknowledged.

When the Dialogue was finally published, after considerable delays and negotiations with the Inquisitorial office, the Pope read it carefully and realized that the Copernican hypothesis, on the motility of the earth and stability of the sun, had been fully confirmed with physical arguments.

Urban VIII was considered one of the characters in the Dialogue, called Simplicio, who upheld the scholastic point of view as personifying the Pope himself. His ire was, therefore, aroused and Monsignor Gianpoli was severely reproached for granting the Imprimatur. Urban VIII had heretofore been an ardent supporter of Galileo. While a Cardinal he loved science and openly sponsored the Galilean postulates, but now his conscience, as a disciple of science and a theologian, was in conflict. He was the responsible head of a great Church. The Reformation was spreading its tentacles everywhere. The Italians, under the leadership of Bruno and Campanella, without an open rebellion like the Germans, had attempted to bring reforms within the Church by the free interpretation of the Scriptures. Galileo, although a pious Catholic and a warm friend of the Pope, by his innovations was leading the enlightened minds from the restricted knowledge into the broad path of experiment and investigation. The Pope felt the Church was being undermined and free thought should be repressed.

Galileo was therefore subjected to untold persecution in spite of intercession of his Prince and the Florentine Ambassador Niccolini. In spite of serious illness, Galileo was compelled to journey to Rome by litter and defend himself before the Inquisitorial tribunal. We have no proof of any actual physical torture. At Castle Sant 'Angelo I have been shown a cell supposed to have been occupied by Galileo, although he spent most of his time in the Embassy of Florence.

Galileo was coerced into the signing of an abjuration while on his knees. The revolt in his soul was such that as he arose, he declared: "eppur si muove!", which means whether you deny or not the earth goes on in its rotation and revolutions!

Galileo's renunciation of his doctrine was broadcast everywhere by the Jesuits and Inquisitors. The scientist was imposed certain penances and permitted to live with the Bishop of Pisa who greatly admired him, and secretly shared his views.

Galileo was broken-hearted. There was nothing to live for except to be near his daughter Maria Celeste, who was a nun and had offered to submit to the penances imposed on her illustrious father. He begged the ecclesiastical permission to retire in the Villa of Arcetri, where the poet Milton visited him.

After three months' residence at Acetri he was taken seriously ill and, to increase his physical and moral sufferings, his daughter died. As hard as this blow proved to be, it did not crush him, for in 1634 he completed his monumental works on "The Laws of Motion" and "The Resistance of Bodies," which were published in France, presumably without his knowledge.

In 1637 the Government of the Netherlands in appreciation of Galileo's calculations on longitude, which had been of such valuable service to that maritime nation, sent a delegation to present the great scientist with a gold chain. Galileo was forced to decline this token of admiration under the pretext that he was unable to complete the negotiations. The Inquisition had put its veto!

It was a comfort to the scientist that after thirty-five years the world had accepted his ideas. In the following year a great calamity befell him. He became totally blind. The universe, which he had scoured with his eagle eye and whose laws he had discovered, was forever cut off from him!

On January 8, 1642 he expired peacefully. By his bedside stood mournfully his two disciples, Viviani and Torricelli, who were both to become famous and carry on his scientific torch. By order of the Duke his body was interred at the Church of Santa Croce in Florence.

Scientific medicine owes a great debt to Galileo. He established a new orientation toward natural sciences. Like Leonardo Da Vinci, he was not satisfied to discover the reasons of a given fact, but searched for a law, exact and mathematical, which determined its phenomena. His was the experimental method: examine all facts with a critical mind and reproduce the phenomena. He did not consider the five senses as sufficient without the control of reason, and also maintained that reason alone, without the control of the senses, was a source of many errors. In this conception he was in perfect accord with the Father of Medicine: Hippocrates.

The science of medicine will ever be grateful to him for his discovery of the laws of oscillation with the practical application to the counting of the pulse; the discovery of the thermometer and its daily use by our fraternity; and as one of those who did most to develop the microscope with its subsequent countless discoveries in the field of biology, botany, pathology and bacteriology. Physics and astronomy will ever remember him for the discovery of the laws of inertia, the laws of weight, the laws of movements, the discovery of the telescope and the establishment of the Copernican system by irrefutable physical proofs.

Navigators will ever remember him for his calculations on the longitude and the perfection of the marine charts. Galileo and later his illustrious compatriot, Guglielmo Marconi, have done more for their safety on the high seas than any other group of men.

The stripping of the Heavens of their mysteries, the banishment of scholasticism from the domain of science and the unselfish and inflexible devotion to truth made of Galileo not only the Immortal Genius of the Renaissance, but the incarnation of Modern Science, the ideal Disciple of Aesculapius.

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ROBERT KOCH

(1843—1910)

AN AMERICAN TRIBUTE

PART III (CONCLUSION)*

By LAWRASON BROWN, M.D.

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FAMILY DIFFICULTIES AND REMARRIAGE

In 1890 Koch had bought and renovated his old home at Clausthal where he was born. In 1893 the estrangement between Koch and his wife, who some think had become a little "difficult" and more or less out of touch with his work, reached such a point that they were divorced in June after twenty-six years of married life. It is highly probable that the fault lay not entirely on one side. Rumor has it that when Koch was deeply interested in a problem he lost all idea of time and possibly of place. He would miss one or two meals a day, and in deep thought would wander past his own home but never past the laboratory. When he did reach home, where he did little more than sleep, he would greet his daughter, whom he always loved tenderly, devotedly, in a distrait fashion and probably took no notice of his wife and little of his food. There is little doubt that Frau Koch, lonely, neglected, resented this and possibly became hysterical, which in turn irked Koch who became increasingly indifferent. The marriage of his daughter and her departure from home helped to accentuate this state of affairs and the divorce followed. Frau Koch went to live in the Clausthal home where she resided until her death in 1913, when her daughter inherited the house. Upon the walls of this house had been placed by his proud fellow citizens a tablet of honor to Koch. Two months after his divorce Koch married Fraulein E. F. Hedwig Freiburg, twenty-nine years his junior, who had been upon the stage. The marriage was without issue, but coming so soon upon the divorce displeased the Government, while some of his closest friends refused to speak to him and the indignant citizens of Clausthal tore down the tablet. As usual Koch went silently on his way and few knew his feelings, but this act may have had something to do with sending him on many foreign trips and banished from his old age some of the serenity that he so richly deserved though probably did not care for.

It is rumored that Koch was never received into the inner medical circle in Berlin. In the first place he had made a grievous mistake. It was quite unforgiveable in Germany for a country doctor or indeed for any physician to make the discoveries, to rise to the heights that Koch had scaled when he did not pass through the usual channels and advance through the ordinary university positions. For this reason he was always considered an outsider. In

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*Parts I and II appeared in the ANNALS OF MEDICAL HISTORY, March, 1935, p. 99 and May, 1935, p. 292.

Germany, it is customary for the newcomer to call upon the older men. Koch did call upon duBois-Reymond but unfortunately left his card at duBois-Reymond's residence instead of at his office. He returned it to Koch, implying that he had made a *faux pas* and refusing to recognize him in this way. They order these things differently in Germany and it is difficult for us in America to grasp their assumed importance, but it remains that Koch was *persona non grata* in certain circles in Berlin, due possibly to an underlying feeling of jealousy. His social position at Court, however, was assured though Frau Koch seldom attended such functions.

A friend relates an amusing anecdote about Koch, whom she first met as a young girl while travelling in the Tyrol. Later during a stay in Berlin Koch came one day to have tea with her. He drank many cups and nibbled at some ginger cookies which she had made by an old Southern recipe. He made good-natured fun of her German which she had learned at a girls' school in New Orleans. He was very fond he said of music and seeing a piano asked her if she would not sing some of the old English songs for him. She sang among others, "Oh! Miss, I'll give you a coach and six, with every horse as black as pitch." When she had finished he remarked, "How sad it is you sing such lovely songs so badly!"

Bovine Tuberculosis

At the British Congress on Tuberculosis held in London in 1901, Koch called attention to the danger of attacking all pestilences alike and recalled that leprosy, very similar to tuberculosis, was being controlled in Scandinavia by the isolation of only certain cases. Pulmonary tuberculosis, he thought, was due to air-borne infection. In his first communications on tuberculosis Koch expressed himself regarding the identity of human and bovine tuberculosis with some reserve, and had to leave the question undecided but now he felt that they differed and human tuberculosis could not be transmitted to cattle for in nineteen cattle, injected with the human bacillus, none developed tuberculosis. The more important question, whether man is at all susceptible to the bovine bacillus is not yet and will not be for some time absolutely decided, but the danger from milk and butter and flesh of tuberculous cattle is hardly any greater than that from heredity. "I do not deem it advisable to take any measures against it," he stated. The improvement of the domestic condition of the poor will lead to a considerable diminution of the disease. He strongly advocated the erection of special hospitals for the advanced cases, and even if only a fraction were thus housed it would lessen infection. Obligatory notification was, he thought, very valuable, as well as disinfection and education about infection. Sanatoria will never render these measures superfluous. It is of interest to recall that Ravenel, working at that time with Pearson in Pennsylvania, opposed the view that the bovine tubercle bacillus could not infect man but had made, of course, no study of the bacilli in pulmonary tuberculosis. In this paper Koch was hardly fair to Theobald Smith who had already shown the difference between human and bovine bacilli in 1898 (Welch).

In 1901 Biggs forwarded to the American Consulate in Berlin a collection of literature concerning the

Board of Health (New York City) regulations and information about tuberculosis. Koch asked for figures and after receiving them said:

> In New York under the influence of general sanitary measures directed in a simple exemplary manner by Dr. Biggs the mortality from tuberculosis has diminished more than 35 per cent. It must be remembered both in Prussia and in New York the progress indicated is due to the first beginnings of these measures. Considerably greater success is to be expected from their further development. . . . I take this opportunity of most urgently recommending Dr. Biggs' organization to the study and imitation of all municipal authorities.

But Koch had little hope for such measures as were in force in New York in Germany until a "younger generation has appeared, which has had a different scientific training, and holds a view more in harmony with the known facts regarding the etiology of tuberculosis . . . " (Winslow). In 1902 Biggs could point to a decrease in the tuberculosis death rate greater than in any other city in the world (40 per cent).

In 1895 Koch suggested that the German Central Committee for the Erection of Sanatoria change its name to the Central Committee for the Control of Tuberculosis, not that he belittled the work of Brehmer and Dettweiler but that he thought the problem should be attacked along broader lines.

In 1902 Koch writes Roepke:

> I am glad to see from your paper that you strongly favor the use of tuberculin for the diagnosis of tuberculosis. I absolutlely agree with you and I am convinced that only by that method may reliable statistics concerning the results of sanatorium treatment be obtained. Very interesting and surprising, even to me, is the result which you have obtained with tuberculin in clinically cured patients. I also believe that the negative reaction in cases which have previously showed a positive one has to be considered as an affirmation of the clinical proof of the cure. However, considering the statistics published by the Health Board last summer, I would not have expected that this would be true in 60 per cent of the cases. Apparently it is due to the fact that your cases have been carefully selected and treated much longer than it is done in other institutions. I have to admit that on account of this fact found by you, I have changed my opinion concerning the efficiency of the tuberculosis sanatoria considerably in their favor. It is highly desirable that your example will soon be followed in the other institutions. By means of the tuberculin reaction, the cases still in a curable stage, could be selected and treated until they were actually cured.

TROPICAL INFECTIOUS DISEASES

During the last fifteen years of his life Koch made many trips to foreign lands studying constantly the infectious diseases. He visited India where he studied the bubonic plague; South Africa to study cattle plague; West Africa to study tsetse fly disease and Texas fever. Malaria in its different forms, such as blackwater fever, also interested him, and he made contributions to all these diseases. He returned to Berlin on the 20th of May, 1898 and again on August 11th he was in Italy investigating malaria. Returning home in October he left for Java and the East Indies in the following April. On this trip he found that the children were what might be called the carriers of the malarial plasmodium. Ehrlich thinks he determined before Ross that mosquitoes transmitted malaria. He again reached Berlin in October, 1900, after visiting Polynesia. His wife, who accompanied him on all these trips fell ill in New Guinea and had preceded him home.

Honors

In 1902 Koch was elected to membership in the French and Austrian Academies of Science to fill the place occupied by Virchow, who had just died. Toward the end of this year he again went to Rhodesia, South Africa, to study red water disease in cattle and a form of horse disease.

His sixtieth birthday was passed in Bulawayo, while at home forty of his students brought out a *Festschrift* of over 700 pages in his honor. A marble bust of Koch was designed by Joh. Pfuhl. He wrote to a friend in December (18) 1903;

> I was overjoyed to receive on my 60th birthday congratulations from you by wire in the distant Rhodesia. . . . I am extremely sorry I was unable to spend this day in my Fatherland, but with the best will it could not be arranged otherwise. I would have had to leave my work, which is almost completed, too soon and who knows what would have become of it.

On a previous trip he had worked out a method of prevention against Rinderpest, but being ordered to India, enemies and "other dear friends" came along and condemned the work. This he would now prevent.

Since 1896 Koch had made one or more trips away from home each year, and now (1904) he thought it wise to resign as director of the Institute for Infectious Diseases. A new building had been erected for the Institute near what would now be called the medical center in Berlin, and in it he had a room and a paid assistant. In 1904 on his retirement he was granted, after thirteen years of fruitful research, an annual pension of 10,000 marks and his close friend, Georg Gaffky, succeeded him. During the six years he lived after retiring from the Institute he spent three of them abroad fascinated with tropical infectious diseases and indulging to the full the great desire for travel which possibly he inherited from his father and which he never lost.

He wrote in December (13) 1904

> There may be some truth, in what you say regarding the Nobel Prize, but I believe that the poor judges are in a rather bad position, because apparently it matters less to recognize actual merit in science than to see to it that the various nations all receive their share of consideration. For I could not explain to myself the choice of Prof. Pavlow (whose name I feel ashamed to say has remained entirely unknown to me until now) in any other way.

In 1905, he himself received the Nobel Prize and spoke on "How the Fight Against Tuberculosis Now Stands." Here again he emphasizes the importance and danger to man of the human type of the tubercle bacillus when compared with the bovine type. He questioned the transmissibility of the bovine type to man, when the two important phases of tuberculosis in man are considered, epidemiologically, generalized and pulmonary tuberculosis. He mentioned that Spengler and Klemperer had proved the harmlessness of the bovine bacilli by repeatedly injecting them into human beings. When found in man they occurred rarely in adults, usually in children and then mainly in the intestines and mesenteric glands. Tuberculosis is frankly and justly considered a dwelling disease, more dangerous to anyone when sleeping in the same room and most dangerous when sleeping in the same bed with a person having the disease.

In 1905 and again in 1906, he was in Africa studying among other diseases, sleeping sickness, his last great work. In 1908 the Robert Koch Foundation was established due, in part, to the generosity of an American, Andrew Carnegie. In the same year died his old friend, Fredrich Althoff, who had had so much to do with obtaining for Koch many of the positions he deserved.

KOCH AND PASTEUR

Von Behring, formerly an assistant of Koch, held that all tuberculosis came from an infection during childhood and was due to the bovine bacillus. Koch refused to accept either of these statements and when Behring patented his "bovovaccine" Koch refused to have anything further to do with him, in spite of the efforts of their mutual friends. Koch was a great man and had strong likes and dislikes; those who sought to know him closely, to learn to understand him, were always his friends to the end. But he appeared overbearing, rough, and intolerant when any one threatened to block his way, as he impressed some Americans at the meeting in camera at the Washington Congress. Pasteur and Koch did not attempt to conceal their life-long feelings of animosity to one another. Pasteur was an actor and believed himself a leader of men. Koch was no actor and assumed no authority until he thought the truth as he saw it was attacked and then he fought valiantly for his views. Koch saw the weakness in some of Pasteur's work and frankly said so. At the Geneva Conference on Hygiene (1882), Pasteur challenged Koch to a debate about the use of attenuated vaccines but Koch, having little taste for such a duel, rose, cleared his throat, said he would write his reply, and sat down. Koch then purchased in the open market some of Pasteur's vaccine for anthrax, which had shown some unpleasant results, found it so badly contaminated that at times it killed sheep, and attacked its use, which Pasteur no doubt thought was an attack upon the idea of the attenuation of virulence. Koch often wondered why Pasteur did not publish his failures when he (Koch) always made it a point to do so. They were never friends, but no doubt toward the end both realized the greatness of the other. Some feeling of jealousy may have actuated Koch.

Vaughan of Ann Arbor, while studying at the Koch Institute, was summoned one day to a conference with Koch in his private room and felt highly honored. But the conference consisted in a bitter tirade by Koch against Prof. Gibbes, whose name Koch bit into two syllables, though Vaughan said he had opposed Gibbes who did not believe in the germ theory of disease. Vaughan's attempt to mollify Koch failed. Vaughan thought Koch was ready to stamp upon those who failed to acknowledge his authority.

E. R. Baldwin had a similar experience with Koch when he met him in 1906. Koch bitterly resented the fact that a man named Koch was attempting in America to capitalize upon his good name and expressed himself freely to Baldwin. Following this, he apparently had little interest in the interview, which was quickly concluded. On the other hand Ehrlich met Koch first in 1878 (?), and they were friends to the end. In 1890, when Ehrlich had no position, Koch took him in and said "Do whatever you wish." He was devoted also to Gaffky.

America

In 1908 Koch left Berlin on his last journey, to visit his relatives in Chicago, while on a pleasure trip around the world. Interviewed by reporters on reaching New York on April the seventh, he later referred to them as "lice pickers." In New York he was elected an honorary member of the Academy of Medicine as well as of the Deutsche Medizinische Gesellschaft. This Society gave a large dinner at the Waldorf-Astoria in his honor at which many of the prominent medical men of America were present as well as Andrew Carnegie, who had recently given 500,000 marks to the Koch Foundation in Berlin. Koch, replying to the many complimentary speeches at the dinner, said:

> Were I to review every thing that has been said in my praise, and also to take into consideration the great distinction conferred by you upon me, I must necessarily ask myself, am I really entitled to such homage? I believe that I can accept, indeed, with a clear conscience many of the laudatory things said about me. But I have done nothing else than what you are doing every day. I have worked as hard as I could and have fulfilled my duty and obligations. If the success really was greater than is usually the case, the reason for it is to be found in the circumstance, that I came in my wanderings through the medical field upon regions where the gold was still lying by the wayside. Fortune is necessary to be able to distinguish gold from the base metals, but that is no great merit.
>
> We have achieved all we could in our fight against tuberculosis. We have come to a point where we hardly hope for more success. The idea of building sanatoria will not accomplish much; such sanatoria will benefit only certain localities. We must make new researches. Such researches will become possible in the Robert Koch Institute in Berlin, a foundation which Andrew Carnegie has so munificently endowed. In this Institute investigation will be made which will open new fields, new theories, new modes and possibilities of fighting the old enemy, tuberculosis. It will be an international affair, benefitting all mankind. And we have to thank Mr. Carnegie for placing this Institute on a sound financial basis. Herr Carnegie, lebe hoch!

He was most anxious to visit the offices and laboratories of the City Board of Health and here we find him with Biggs, Bolduan and four or five others. Much interested in some mortality charts of the city, he pointed out that the mortality curve was assuming more and more the form of a parabola. "Unless some new weapons are devised," he remarked, "we shall soon see the curve becoming flat and mortality stationary." Turning to Biggs he said, "And Biggs we are all looking to you. What are you going to do next?" Those who knew Biggs can see the quizzical smile which spread over his features as he calmly and deliberately, as always, observed that he thought that there was much still to be done along the old lines. The great immediate problem, thought Biggs, was the provision of some remunerative occupation for patients in whom the disease had been arrested. "At the present time," said Biggs, "most of our sanatorium work is wasted for usually we are compelled to return the healed patients to the same environment from which they have come and which has been largely responsible for their breakdown." This no doubt confirmed Koch in his former opinion that in antituberculosis work the sanatorium was not of paramount importance. "In view of the extraordinary difficulties which confront the health board, and in view of the matter of immigration and in view of the extremely unfortunate conditions of life in the over-crowded tenement houses," Koch considered the work and methods carried out in New York as "exemplary."

In July he reached Tokyo where he was welcomed as a prince, a temple erected in his honor in the grounds of Baron Kitasato's Institute and he was almost deified. Here he received word that the Kaiser wished him to represent Germany at the Washington International Congress on Tuberculosis in September. Lawrence F. Flick, the Director General of the Congress, had cabled freely to Germany and finally in this way brought pressure to bear on Koch so that he had to interrupt his trip and return to Washington, where he arrived in a hot temper.

At the Washington Tuberculosis Congress Koch recalled that in London he stated that human and bovine tubercle bacilli are different, human beings may be infected with bovine bacilli but serious disease rarely develops, and that preventive measures should be directed primarily against the human bacillus. He stated that the work of Theobald Smith on the differences between the human and bovine led him to take up this work seven years after his first paper, and ten years after Smith's work was published. He proceeded to lay down laws to be followed to prove such views, and stated that the only experiments that met these conditions were those conducted at the Imperial Board of Health in Berlin; those of the British Commission did not. He refused to accept any intermediate type of bacillus. "To my knowledge, the bacilli of the human type have never been demonstrated in cattle." "Up to date, in no case of pulmonary tuberculosis," writes Koch, "has the tubercle bacillus of the bovine type been definitely demonstrated." They have, however, been found in the cervical lymph nodes and in the intestinal tract. At this Congress there was held a meeting in camera over which Biggs presided at which the author was lucky enough to be present. Here Koch stoutly maintained these views and challenged any one to show that bovine tubercle bacilli do occur in pulmonary tuberculosis. Therefore, he continued, the greatest efforts should be concentrated to prevent the spread of disease from man to man. Later they were shown to occur in less than 1 per cent. Koch was dogmatic and overbearing in his attitude, which was in strong contrast to that of Prof. Arloing of Lyons. But it must be remembered that Koch was there against his will and it took but little opposition to ruffle an already uncertain temper. As the discussion between Koch and Arloing was becoming acrimonious Biggs brought the discussion to a rather abrupt close and gave out for the papers a diplomatic statement to which few could object. The most interesting thing that Koch saw in Washington was Barber's method for isolating single bacteria. At first Koch said it was impossible and refused to believe it but Barber convinced him by a demonstration of the method. The committee on entertainment had reserved a number of seats at a boxing match and Koch accepted an invitation to attend but shortly he returned shaking his head sadly—his better-half had refused her permission.

In 1909 he wrote Roepke:

> I thank you very much for your kind intention of dedicating the 3rd edition of your text-book to me, but I beg you to give up this idea for the simple reason that the dedication of books does not seem fitting in the twentieth century. At the time of our grandfathers it was a common custom, but since then it has rapidly decreased and now it occurs only sporadically as a reminiscence of the good old times which, unfortunately, have irretrievably passed.
>
> However, I am perfectly willing to write a short preface to your work, although it does not need that very badly. Both of the previous editions have had very good success without my preface and it would be the same with the third now. But I should not like to oppose your wish.
>
> In that case, I beg to ask whether, in this newest edition, you have considered Wassermann's complement fixation method for the demonstration of antibodies in the blood of specifically treated tuberculous patients, and Bauer and Engel's studies in this connection concerning the treatment of tuberculous children with large doses of tuberculin. Also a paper of Schlossmann, in the last issue of the *Deutsche medizinische Wochenschrift*, gives some more information about that subject.
>
> These investigations seem to me very important and I believe that they will lead to further progress in a short time. In any case, Wassermann's method gives a much better control and guidance in the specific treatment than Wright's determination of the opsonic index.

INFLUENCE OF KOCH'S WORK ON TUBERCULOSIS

An endeavor to present the ideas prevailing about tuberculosis at the time Koch made his memorable discovery will help to infer what addition his work has made to our present conception of tuberculosis. He stated, you will recall, that Cohnheim had already conceived the idea that it was an infectious and contagious disease and had sketched its etiology. But few accepted such ideas until Koch brought forward the definite proof. From that time onward direct heredity of the germ has played only a minor part for the bacillus has only in rare instances been found in the infant at birth. This Koch foresaw. All our ideas of the distribution of the bacillus in or outside the body of man or animals have been developed since the bacillus was discovered. At first it appeared as if the problem of the modes of infection had been solved by Koch when he described conveyance of the bacillus by dust and intimated that droplets might play some part, a problem much worked over by his old assistant Flugge. It must be acknowledged, however, that this problem is still far from settled if we but recall the controversy over whether pulmonary tuberculosis starts from a primary or from a secondary infection, and whether that comes from without or from within, in childhood, adolescence or adult age, by inhalation or by other portals of entry. The bacilli must often gain entrance into the blood but still today we have great difficulty in discovering them there.

1. ON PATHOLOGY. The pathology of tuberculosis was placed upon a firm basis by this discovery. The connection of the tubercle with

tuberculosis starting with Sylvius was held and modified by Manget, Morton, Stark, Reid, Baillie, Bayle to Laennec, Louis and Rokitansky. Virchow opposed this conception, and only by such a demonstration as Koch gave could such authority be overcome. Where the tubercle bacillus could be shown to be the only predominating organism, there the pathological change must be tuberculous. The whole subject had to be reworked though much had already been done by Koch himself.

2. ON DIAGNOSIS. The importance of the bacillus in clinical diagnosis has already been mentioned. Koch stated that careful research never failed to disclose it in the sputum of the 29 cases of pulmonary tuberculosis which he had studied. Today we insist upon search for the bacillus in all cases but recognize also as did Koch that in some discharges, in some pus from tuberculous lesions, it is difficult, if not impossible, to find the bacillus when inoculation of the discharge produces tuberculosis in the animal. The nearly constant presence of the bacillus led for a time to the postponement of the diagnosis of pulmonary tuberculosis until it could be found, a procedure which deprived some patients of a chance to recover. This is now no longer followed. Many methods of searching for the bacillus in the feces, urine, pleural fluid, stomach contents and other secretions have developed in due time. The discovery of the filterable forms may yet prove Koch's contention that the bacillus is always present in the sputum in pulmonary tuberculosis.

It seems needless to recall here the significance in diagnosis of exposure to infection. Indeed in the tuberculous infant today, Dr. Edward Park tells us that it is rare not to find the source of infection in the immediate household. I personally am of the opinion that such exposure to contagion plays in pulmonary tuberculosis a very important part up into the third decade. Its importance in diagnosis was clearly recognized by Jerome Fracastor, the founder of the germ theory of disease. The Italians and Spanish were both convinced of it in the middle of the eighteenth century. Morgagni even refused to open the bodies of those dying of phthisis. But in the North such views did not hold. You may recall that Sauvages in France, and Morton in England, described many varieties of phthisis and that Laennec placed less importance upon contagion. Heredity at this time was considered the most important factor in diagnosis. In fact the importance of exposure in diagnosis was still questioned even as late as when Welch rewrote the pathological sections in Flint's "Practice of Medicine." Flint was among those who believed firmly in the importance of contagion.

The significance of certain symptoms in the diagnosis of pulmonary tuberculosis has always been recognized, and the insidious onset has just as long led to confusion with other diseases. The importance of hemoptysis in diagnosis has no shorter history than that of contagion but not until the nineteenth century was hemoptysis definitely considered to be the result rather than the cause of tuberculosis. Pleurisy with effusion was never accurately diagnosed of course until the time of Auenbrugger and even until Laennec's discovery of auscultation few risked such a diagnosis. Even Bowditch, who did so much to take the treatment of pleural effusion out of the hands of the surgeons to place it in the domain of the physician and so to save many, many lives, did not attribute to this symptom its true significance. This came only towards the end of the last century.

Physical diagnosis as we know it today was born with Laennec but during the short ten years of his life that were devoted to its study, he had no time to investigate the early diagnosis of phthisis and indeed from his point of view, viz., that the tubercles had to develop, to soften, and to discharge before a cure could take place, early diagnosis was of no avail. Early diagnosis of pulmonary tuberculosis we owe to Louis, and from him it spread to this country. Among his students none has left us a more accurate description of it than Bowditch in his "Young Stethoscopist," a description that could be copied today word for word into any book upon the subject. Here also we find physical signs properly balanced with symptoms.

However we must not deceive ourselves into thinking that because some of the leaders of medicine used such advanced methods it was either common knowledge or common practice among the medical profession. Koch of course was keenly aware of all this and no doubt had puzzled over many suspicious cases, wishing for a ready means of diagnosis so that without hesitation he could urge suitable treatment.

You will recall that he stated in his "Etiology of Tuberculosis" that in every case of pulmonary tuberculosis which he had examined he had found tubercle bacilli in the sputum. It is interesting to recall how slow some good clinicians were in accepting the importance of the tubercle bacillus in diagnosis. Dr. Trudeau told me many years ago of a young Harvard student who, suspected of having pulmonary tuberculosis, was sent to him for diagnosis. Not long before this Trudeau had climbed the narrow steps to Prudden's little laboratory in New York to learn how to stain the tubercle bacillus. He was led to do this from his study of Koch's paper of 1884 which Mr. Charles M. Lea, of the medical publishing house of Philadelphia, had been good enough to have translated for him, an act which was really at the bottom of the foundation of the Saranac Laboratory, as I mentioned. In the sputum of this young Harvard student he found many of the slender rods so well described by Koch though in the patient's chest he could detect no evidence of disease. The family were not satisfied and took the boy to a leading specialist in New York, Dr. Alfred A. Loomis, himself a sufferer from tuberculosis. Loomis, finally a victim of the disease, heard nothing abnormal in the boy's chest, pooh-poohed the idea of tuberculosis, and allowed the boy to return to Harvard. In a year or two he relapsed and eventually died. Few such instances were necessary before the value of the tubercle bacillus in diagnosis was fully grasped. But as soon as this was fully appreciated many concluded that tubercle bacilli in the sputum must be present in every case of pulmonary tuberculosis, which Koch's paper led them to infer and, on the contrary, if tubercle bacilli were not found the patient could not be suffering at that time from tuberculosis.

This was the state of affairs when I left medical school some thirty-four years ago and first met Dr. Trudeau. He and a number of other workers clearly realized that it was for many patients a dangerous thing to wait for the occurrence of tubercle bacilli in the sputum before making a diagnosis of pulmonary tuberculosis. Many lives they thought were in this way likely to be sacrificed. They emphasized the danger and gradually the idea spread through the profession. But the pendulum swung as it so often does, too far, and before long many attached too little significance to the presence or absence of tubercle bacilli in the sputum. This idea was in turn combatted and attention called to what some stated to be the large number of patients collected in sanatoriums both in this country and in Germany who had not and, indeed, never did have pulmonary tuberculosis. Such cases we were told were more numerous following epidemics of influenza. This emphasized the importance and helpfulness of Koch's tuberculin reaction in the diagnosis of such cases, to which we will return in a moment.

As early as 1896 the roentgen ray began to be introduced into the diagnosis of these cases. Up to this time, few, save some markedly neurotic individuals, sought to convince anyone that they had so serious a disease as pulmonary tuberculosis. But later came the World War with its ghastly experiences, its sufferers from shell shock, and even those with the soundest nervous system dreaded to return to the hell and water found in the front trenches, to the sallies into no man's land, and to going over the top in the dead hour of the morning. As man power became more important, excuses to escape such torture became more common, especially among those with unstable nervous systems. And now the diagnosis of early tuberculosis assumed great importance. Symptoms which were considered significant in civilian life must now be disregarded for, due to dampness, catarrhal conditions grew in frequency and even malingering occurred, especially among those, please remember, with unstable nervous symptoms. The French met this problem with the statement that no man could be considered to have pulmonary tuberculosis unless his sputum contained tubercle bacilli. This belief, which has persisted in France since the World War, has brought the status in regard to the significance of the tubercle bacilli in diagnosis back to what Koch suggested in his first paper in 1882. It has also emphasized the importance of adopting in the examination of the sputum for tubercle bacilli the best methods. From such studies many would have us believe that few cases exist in which repeated examinations and inoculations of sputum do not show sooner or later the presence at some time of tubercle bacilli in the sputum. This would lead us of course to use the terms open and closed tuberculosis more carefully, or better to replace them by tubercle bacilli present or apparently absent from the sputum. Some of the French are now retiring from such an advanced position and are coming around to the view held here for years that in certain cases it is justifiable to make a diagnosis of pulmonary tuberculosis without the discovery of tubercle bacilli in the sputum.

Koch himself suggested that in time he thought other bacilli would be found that would give the same staining reaction as the tubercle bacilli. This has occurred; but singularly few cases of pulmonary disease have been so complicated though it is rather frequent to find acid fast bacilli in urine which do not infect guinea pigs. Some claim of course that such bacilli belong to the avian type though it seems to me more likely that they are smegma bacilli. Study of the urine has shown that bacilli are at times discharged in showers between which it is difficult or impossible to find any bacilli. Of course this may happen in regard to the sputum and makes it extremely difficult to say that any patient with pulmonary tuberculosis has no tubercle bacilli in the sputum even after negative animal inoculations.

More recently the description of splitter sputa, of filterable forms (possibly only particles of broken bacilli), producing, some say, peculiar pathological changes, of non-acid fast types of tubercle bacilli, all emphasize, whether or not we accept them, the continuing importance of Koch's discovery in the diagnosis of tuberculosis, without which it is impossible for us to think of tuberculosis.

In brief, this discovery demolished the dual concept of phthisis held by the heretics Virchow, Niemeyer, Ruehle and others, and proved correct Laennec's idea of the unity of tuberculosis, upheld by Louis and a few others. The discovery of the tubercle bacillus and the determination of the pathological changes it conditioned, helped the clinician to set a very much clearer limitation to the disease tuberculosis; even if more recent knowledge has led us to separate tuberculous infection from tuberculous disease. Certain diseases of the serous membranes, of the bones and joints, of the glands, of the skin, and more particularly of the eye, long considered of doubtful etiology, were shown to be tuberculous. The presence of the bacillus in the urine, as already mentioned, in the spinal fluid, in the stools and in other secretions greatly simplified clinical diagnosis. Recent studies have shown the necessity of an early examination of the sputum in the so-called cases of subclavicular infiltration and in some rapidly clearing lobular or even lobar tuberculous pneumonias for otherwise the tubercle bacilli may never be found.

Now Koch had called attention to the observation, which I have mentioned, that if a very small quantity of tuberculin, 0.0001 c.c. to 0.001 c.c. were injected under the skin, most patients with tuberculosis would react within eight to twenty-four hours. A healthy man, Koch said, would not react to ten times such a dose. This subcutaneous tuberculin reaction was widely used but was criticized by some observers as dangerous and for this reason many ceased to use it, though in Saranac Lake and at the Johns Hopkins Hospital, few if any permanent unpleasant results occurred and under certain conditions its use was continued. We could never convince ourselves that it mobilized the bacilli. More recently Clemens von Pirquet, the late Viennese pediatrician, and once a professor in this country, found in 1907 that injection of tuberculin into the skin produced a local reaction in the skin alone and thus removed all such objections to its use. Later still it was found that all tissues of the body reacted more or less in this way and many variations of the test were devised. It is difficult to estimate how very great has been the value of these tests in diagnosis in man and in cattle and in the anti-tuberculosis campaign.

3. ON TREATMENT. In evaluating the influence of Koch's work upon the treatment of tuberculosis, it is again necessary to keep in mind the status of the treatment at that time. The reproach uttered in 1830–1850 that the main effect of the early diagnosis of pulmonary tuberculosis was to shorten the life of many patients, was not without foundation. You will recall that the London *Lancet* said that if Bodington should continue to treat his patients with such phlogistic food as beefsteak he would be liable to a suit for malpractice. With the limitation of food, the excess of exercise, and the fear of fresh air, of night air, of change in the temperature of the air, you can easily imagine what a short way was taken with the phthisikers. In 1882, however, Bodington was forgotten and Brehmer and Dettweiler had begun the treatment of pulmonary tuberculosis in the sanatorium. Brehmer was still prescribing exercise and hydrotherapy and Dettweiler on the contrary was insisting upon advocating rest in the open. No sanatorium existed in America, but shortly Trudeau was to open his. Forlanini had not yet dared to practice artificial pneumothorax. All was still empirical, and tuberculosis was still claiming its one-seventh of all deaths and one-third of all those occurring during the period of men's greatest efficiency.

The importance of the discovery of the tubercle bacillus in the treatment of tuberculosis is shown in many ways. In the first place it still remains the only absolute proof of the presence of tuberculosis. In doubtful cases it emphasizes when present at the outset the importance at once of rigid treatment. It gives us from inference some knowledge of the presence and healing of bronchial ulceration. We infer when tubercle bacilli are present in the sputum that ulceration into a bronchus has occurred, and per contra when they disappear, that ulceration has at least in part healed. Some insist upon the inoculation of the sputum into a guinea pig, so important do they consider this point. Following an acute bronchitis tubercle bacilli may for a time reappear. The bacillus has served as the starting point in chemotherapy for Koch and many after him but so far, as Koch predicted, no efficient treatment has arisen. Many, however, still pursue this bacillary chimera, as some would term it. I shall not be suprised if by chance some fortunate workers some day may happen upon such a substance that works very differently in the body than it does in the test tubes. I doubt if any substance will ever be accepted as I have said before as a cure for tuberculosis until it has worked effectively upon animals artificially infected with the tubercle bacillus. The value of these bacilli in the diagnosis of many extrapulmonary conditions is reflected as well in the treatment of such conditions.

At the International Congress of Medicine, held in Berlin in 1890, Koch announced that he had discovered a substance later called tuberculin, and described its action on tuberculous guinea pigs. He omitted all details and added that his work was not yet completed. Incipient phthisis he thought could be cured with certainty, but in far-advanced cases with large cavities, tuberculin helped but little. Coming from such an authority the world stood thrilled. The late Sir William Osler, with his characteristic generosity, sent one of the two bottles of the priceless tuberculin, which he had received from abroad, to Trudeau. The sad awakening came soon, due in part to overdosage and disastrous reactions. Koch's caution about the treatment in the advanced stages of the disease was disregarded and some deaths apparently followed, as we have already noted.

The amount of work that has been expended in developing new forms of tuberculin has been prodigious. In this preparation the tubercle bacillus has been treated and maltreated; it has been grown upon many different media which have been subjected to all kinds of manipulations producing hundreds of "different" tuberculins. And still the search goes on. Koch thought that tuberculin produced an active immunization and today we question if such be possible after the germ once acquires a foothold. The explanations of the tuberculin reaction are as numerous as the types of tuberculin and few agree. But as with chemotherapy, many have listened with credulity to the whispers of fancy, many have pursued with eagerness the phantoms of hope, little realizing that by their very efforts they prove that what has preceded has been futile. And yet I must claim some kinship with them and still hope that some day, some method will be found by which we can determine the effect of each individual dose and so change the occasional benefit into a frequent occurrence.

I believe that we can never repay the debt we owe to Koch for giving us our only absolutely sure, our only pathognomonic sign of pulmonary tuberculosis, the tubercle bacillus. In treatment, apart from what influence early diagnosis exerts, Koch's work has played a far less important rôle. In pulmonary tuberculosis his "specific" treatment is, in this age of the surgical treatment of pulmonary tuberculosis, very rarely used; while in extrapulmonary tuberculosis, light, roentgen ray, gold preparations, cauterization, have replaced almost in toto treatment by tuberculin. In tuberculosis of the eye alone it has held its ground.

It is difficult to discover that Koch had any great interest in the treatment of tuberculosis apart from his desire to discover a cure for the disease. You will recall that he had the name of the Central Committee for the Erection of Sanatoria changed to the Central Committee for the Control of Tuberculosis. The treatment of pulmonary tuberculosis in sanatoriums while important would, in his opinion, never solve the real problem which was concerned with prevention until a cure was found. When he observed that a tuberculous guinea pig reacted differently from a normal animal to an injection of tubercle bacilli and that the quickly forming ulcer as quickly healed, his so-called phenomenon, he thought he would soon discover the cure. But he, like many others, soon became lost in a maze with many blind alleys, hoping always to reach the central arbor where they thought lay the key to the explanation of the tuberculin reaction and so probably to successful specific treatment. His last communication, a few weeks before his death, was still upon tuberculosis.

4. On Prophylaxis. Probably in no branch of tuberculosis study has the discovery of the bacillus exerted

so fruitful an influence as in prophylaxis of the disease. Koch stated that the bacilli in the sputum were the most important factor in the spread of tuberculosis, and later, as you know, denied the importance of milk from tuberculous cows. It is difficult to follow blindly the views of the Master in regard to milk for since pasteurization has been widely employed tuberculosis in the early ages has greatly decreased. Whether this is post hoc or propter hoc is not yet definitely settled though I feel inclined to believe that pasteurization has exerted much influence. At that time one-seventh of all deaths were due to tuberculosis. In 1882 the mortality rate in cities of the United States was 326 per 100,000 living; in Philadelphia it reached 318, in San Francisco 323, and in New Orleans 396; while today in the United States it has fallen below 70, reaching in New York in 1931, 69, and in Philadelphia in 1930, 71. Not a direct but an indirect attack upon the disease, carefully planned, as Koch suggested, has brought this about.

Seizing upon these facts Biggs forced upon the City of New York most efficient measures against the disease. I should like to ask you to wander with me to East 25th Street, New York, where at number 58 night after night there foregathered Biggs, Prudden, Harry Loomis and the elder Janeway, talking, discussing, planning into the wee hours of the night of how with the new knowledge of the contagiousness of tuberculosis already at hand they could get it across to the medical profession and so save in the great city thousands of lives that were needlessly sacrificed through ignorance. Three of them were shortly instructed to write a concise statement about tuberculosis and concluded it by saying: tuberculous is distinctly preventable; it is not inherited; it is acquired usually by direct transmission from the sick to the healthy; and can be prevented by inspection of meat and milk and by dissemination of knowledge that every tuberculous person whose discharges are not immediately destroyed or rendered harmless may be a source of danger to his associates; and that every room occupied by such persons should be carefully disinfected. This report led to the issuance of the first circular upon tuberculosis for the public and was the beginning of the campaign against tuberculosis, which, thanks to Biggs' indomitable perseverance and courage was to place New York City in the foremost position regarding the control of tuberculosis. Such steps as this led Koch to believe that in America his work received its highest recognition. Others too had realized the great practical importance of Koch's work. Sir Robert Philip, recognizing the "urgent need for the collection of facts concerning the ubiquitous disease" and particularly the necessity for discovering the sources of the disease in the home, was led to establish the first tuberculosis dispensary in 1887 and later inaugurated the Edinburgh Anti-tuberculosis Scheme. Some years later Calmette founded a similar dispensary in Lille. Flick, standing practically alone, forced eventually upon an undivided, doubting medical profession, gathered together in the College of Physicians in Philadelphia to oppose his views on house infection, laws based upon sound ideas. Cleanliness, disinfection, proper lighting, sufficient ventilation, institutional care for advanced cases, proper methods of dusting, dispensaries, sanatoria, the proper disposal of sputum, the covering of the mouth when coughing, and a thousand and one other measures have brought the mortality from tuberculosis, in spite of war, in spite of depression, to such a figure that, thanks to Robert Koch, before many decades tuberculosis will be considered to be one more of the great infectious and contagious diseases that man has conquered.

Koch developed, Rich says, four great trends of work in tuberculosis; (1) the nature of the tubercle bacillus; (2) the nature of the reaction of tuberculin; (3) the nature of allergy and its relation to immunity; and (4) the possibility of protective vaccination against tuberculosis. None of these did he finish and still today we have the same problems.

Last Years

Koch never completed his pleasure trip around the world but returned to Berlin and as usual was concerned with problems having to do with tuberculosis. His last address, given before the Academy of Science, April 17, 1910, had to do with the epidemiology of tuberculosis, in which he stressed the importance of accurate statistics of mortality, the necessity of caring for the individual patient, and proper house hygiene.

Only the inner circle of his friends and his collaborators knew his great charm, for he treated even the youngest as a colleague and so advised with him. He was at his best in the conferences. He was always ready for a discussion and was very clear in his statements. He rarely changed a manuscript as it was not necessary. He was familiar with botany, zoology, physics, mathematics, chemistry, mineralogy, astronomy, and enjoyed ethnology, anthropology and the early history of the world, and while he liked philosophy, he had no taste for boundless speculation and mysticism. He hated congresses and "occasions." His great intelligence, his great ingenuity, his marked capacity to carry on his problems to a finish, his great joy of soul in keen close unremitting work, his great severity in self-criticism, his great fertility of resource in overcoming apparently insurmountable difficulties by ingenious inventions, his great perseverance and patience, his great courage in undertaking problems where the princes of science had failed, his clear understanding, his keen critical sense, his excellent memory, his tenacious endurance, his grasp of the practical application of his discoveries his search for absolute truth, made him a great investigator, a renowned scientist, a real genius!

Simple and without pretence, he cared little for all the honors emperors, kings, princes, scientific bodies heaped upon him, and he had the highest and many, many of them. But did he need them? He had discovered the tubercle bacillus, the cholera germ, the germ of Egyptian ophthalmia, proved the anthrax bacillus to be the cause of anthrax, made notable contributions to the victories gained over malaria, blackwater fever, sleeping sickness, bubonic plague, discovered the cause and in some the method of prevention of many diseases among cattle and horses. *Si honores requiris, circumspice!**

* In America, a hospital (St. Louis), a medical society (Chicago) are named after Koch and an effigy of Koch now stands in the Chancel Screen of the Riverside Church, New York.

"I have decided," wrote Koch to Kirchner in 1903, "at the conclusion of my sixtieth year to retire and possibly earlier, for more than some others after my many years of strenuous work, I have deserved some rest. I believe also that my health is broken and that my pension comes not as an act of graciousness but as an act of justice."

By 1909 he long had had an irregularity of the heart but he never spared himself and was apparently hale and hearty, full of bodily and intellectual vigor. Of a serene and quiet old age he could not dream. His hair was getting lighter, his beard grey, his back slightly bent, but his carriage was erect. On the evening of April 9, 1910, following an attack of influenza but also after a day of energetic work at the Institute, he had a severe attack of angina pectoris, which recurred in a milder form ten days later. Friedrich Kraus diagnosed myocarditis and gave a serious prognosis. With great exertion he visited his daughter about the middle of May and both thought it would be the last time they would see each other. Then he became a bit more cheerful and a few days later, on the 21st of May, went for a change to Baden-Baden. On the 27th, at the suggestion of his wife, he dressed and while sitting on the balcony facing a glorious sunset, fitting for the departure of such a spirit, his chin dropped upon his chest and gently, without a struggle, he fell into the last long sleep that awaits us all, spared the sad consciousness of prolonged bodily and intellectual decay. In silence, in the presence of his wife, his daughter, and one or two intimate friends, his body was cremated and his ashes now rest in a niche behind a marble tablet in the Robert Koch Institute for Infectious Diseases, from whence forever his great work goes forth to serve and to save mankind.

The author particularly desires to express his gratitude to Professor William H. Welch, whose personal communications have proved invaluable. He wishes also to thank Miss Mathilde Koch, who read the manuscript.

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[The End]

[From Fernelius' Universa Medicina, Geneva, 1679.]

EDITORIALS

COLONEL FIELDING H. GARRISON

IN these complex days of continual change, it is unusual for any man to attain distinction in some sphere of human knowledge and to maintain that distinction for years. The scientist in his laboratory may make some remarkable discovery that pushes him at once to the forefront of public interest and assures him immediate publicity. In a few years, however, some other scientist in similar fields has made another discovery and the first man, if not entirely forgotten, is, at least, overshadowed and almost lost.

Colonel Fielding H. Garrison acquired distinction in the field of Medical History with the publication, in 1913, of the first edition of his "Introduction to the History of Medicine." This book has remained, during the past twenty years, a perfect mine of historical information, to which almost every medical historian eventually has to go and which remains today the one work of general reference in this portion of the historical discipline. It has passed through four editions. The last edition was almost entirely revised and greatly expanded. But it remains what it always was—an authoritative achievement. His work on the Index Medicus and the Index Catalogue of the Surgeon-General's Library was a greater achievement still.

During these same twenty years, Colonel Garrison kept in the very forefront of medical history in America. It was to him in his crowded little office in the Surgeon General's Library in Washington, that all of us turned in our difficulties, when we had become muddle-headed through the confusion of badly correlated material or puzzled by the memory of some quotation, that we could not find; when we had been asked to read some sort of a paper for a county medical society and wanted a pleasant subject, with a historical background, or when we were seeing light at last after years of patient research along one definite line and needed courage in order to follow this light to the end. In all these situations, Colonel Garrison offered not merely a willingness to help, but also such definite assistance that we came away from his office with new vision, with new courage and with wider knowledge. He was never the type of man who would pat you on the back and tell you what a wonderful piece of work you were doing. He was very chary of compliments, but you always got from him the truth, so far as he saw it. It was not always easy to take his advice or to do what he suggested. Sometimes he would tell you that all your work on a certain subject had been useless, that the thing had been done before by a better man than you, that what little material you had collected came from secondary sources and that your wisest plan was to dump your manuscript and all your little library cards into the waste basket and begin all over again. Men, therefore, who went to him seeking approbation and one or two suggestions, with which to adorn the article that they were preparing, did not fare very well at his hands. Usually, they did not take his advice and usually the stuff that they produced was exactly what Garrison said it was. Those others of us who were really seeking not for approbation, not for compliments, but for the plain, ungarnished truth, for the opinion of an expert and the judgment of a man who knew his material, we found in him sometimes a stern task master, sometimes a rather hard judge, but once we had accepted the judgment, once we had recognized the value of the specialist's advice, then, the whole relationship seemed changed and Colonel Garrison would give himself without stint, in order to keep up our courage, to stimulate our ambition and to help our uncertain steps. He would tell you to throw away everything that you had written and if you did throw it away, he would sit down at your side and spend days in trying to show you how you could revise the muddled material and make a success out of what he had felt forced to pronounce a failure.

He had high standards not only for others, but also for himself. He worked as few self-made historians have worked. He had the determination, the *Ausdauer*, the *Sitzfleisch* of the Teutonic peoples, whom we often pretend not to admire. But besides this concentrated power of study, he possessed a memory that scarcely ever let anything slip. One of the few faults of his ordinary style was a constant tendency to introduce quotations. He seldom wrote a letter without quoting at least five or six different authors. This was because his mind was so steeped in English Literature and in the literature of other countries as well that the most casual word in the most casual letter suggested to his mind something that he had read ten years before in Addison or in Fielding, in Schiller or in Rabelais.

He had one curious habit that should, perhaps, be noted here. He loved to turn his thoughts into writing. He enjoyed writing friendly letters in his neat, minute hand, but occasionally he enjoyed himself also in writing letters that were better not written at all. He would acquire towards someone a sense of deep embitterment. Under his rough external surface, he was very sensitive and often he imagined slights that were never intended. He would brood over the short-comings of one of his friends or colleagues. He would stew over them for months and then, when this witches' brew reached a boiling point and when he could no longer contain himself, he would sit down and write to that person a letter. And what a letter! Most of us who knew him well have at some time or other received a letter of this type. Colonel Garrison had a great gift of invective. He could dip his pen in gall and write so insultingly and yet so cleverly that the recipient would paw the air and foam at the mouth, as he read the scathing lines. Naturally, men who did not understand took umbrage at such letters and, as friends, became lost to Colonel Garrison. But those of us who understood merely put the letters in the waste paper basket, knowing that the next day the Colonel would drop in and murmur a sort of shamefaced apology for having allowed his pen to run away with itself.

The dominating interest in his life was not medicine; it was not medical history; it was music. He got more satisfaction out of listening to a symphony concert than in listening to the most distinguished of all lecturers. He would rather sit down and play the piano by himself than hold converse with the ablest scholar.

He was a complex character in many ways. It was hard to know how he would react. You might offend him without meaning to, for he was very sensitive in very unexpected places. As a reaction to this sensitiveness, he set up a rather hard and frigid exterior. He was, however, very far from being the hard-boiled martinet that he sometimes strove to seem. Beneath all this outer shell, there was the very warm heart, as well as the keen sympathies of a musician and the varied reactions of a scholar.

His loss to medical history in general is very great. His loss to the Institute of the History of Medicine, at the Johns Hopkins University, is greater still. Greatest of all is his loss to a small group of us who had known him for years, who understood all his peculiarities, who had learned how to avoid the sore spots in his character and who admired him profoundly. Occasionally, we almost loved him, but there was never a moment in which we did not respect him.

John Rathbone Oliver

THE ELEVENTH ANNUAL MEETING OF THE AMERICAN ASSOCIATION OF THE HISTORY OF MEDICINE*

THIS Association started its second decade of existence with one of the best and fullest programs that it has yet presented. Dr. Chevalier Jackson's account of O'Dwyer's invention of intubation for diphtheria (the year 1935 being the fiftieth anniversary of this discovery) was notable as an example of a master being extolled by a pupil who had attained equal distinction as a founder of a new branch of the medical art. Adding to the interest was the exhibit of O'Dwyer's original instruments and professional bag obtained for us by Dr. James Elliott from Prof. J. W. Crane of the Western University of Ontario. Other biographical items were Esmond Long's sympathetically critical evaluation of Benivieni, the pioneer Florentine pathologist, and Reginald Fitz' eulogy of the great but neglected Dr. Watson, who eventually was revealed as the celebrated colleague of Sherlock Holmes! In the domain of Folk Medicine, were Harlow Brooks' description of a Navajo sing for the cure of a tuberculous girl, a rare ceremony for a white physician to attend, and Dr. Walter C. Alvarez's detailed, humorous survey of medical superstitions of many lands and ages, including those of the United States of the twentieth century. Bibliography was represented by Dr. Edward F. Kiser's description of his copy of Wolveridge's "Speculum Matricis," one of the rarest books on Midwifery. In the field of Obstetrics were Dr. Alec A. Preece's study of "Fetal Presentations in Medical History" and Dr. Walter B. Mount's description of "Quaint Obstetric Practices of the Eighteenth and Nineteenth Centuries." From the Navy, came Dr. Richard C. Holcomb's "Relation of the Care of the Sailor to the Administration of Public Health" and Dr. C. S. Butler's "Pride of Opinion and its Influence upon the History of Medicine." Dr. Bernhard W. Weinberger presented an interesting study of Washington's physiognomy based on Houdon's life mask and various portraits, showing how the asymmetry of his face was brought out by duplicated manufacture of each half, also showing the effect of the clumsy artificial dentures of the period. Philosophic evaluations of the positions of Mayow and Lower in seventeenth century science, by J. F. Fulton, and of the significance of tarantism (a communal psychoneurosis of Italy's heel falsely associated by the laity with the bite of a spider) by Henry Sigerist, touched a high plane of historical study and thought.

To the American section of the International Association of Medical History (which holds its 10th Congress in Madrid, September 23–29, 1935), the Association elected as its official representatives to the Congress, Doctors Henry E. Sigerist, Howard Dittrick and E. B. Krumbhaar. As officers for the ensuing year it elected Dr. William S. Middleton, of Madison, President: Dr. Walter C. Alvarez, of Rochester, Minn., Vice-President; Dr. E. J. G. Beardsley, of Philadelphia, Secretary-Treasurer, and Dr. Carl V. Weller, of Ann Arbor, incoming member of the Council. The Secretary reported that the Society now had 315 members, the largest number in its history. An effort is being made to effect a closer affiliation with the numerous small and large medical history groups throughout the country. It is even possible that notices of their programs and activities might be published in this journal. The banquet, which was attended by some eighty members of the Association and their guests, was enlivened by the presentations of Doctors Alvarez, Fitz and Sigerist. A minute on the death of our ex-President, Colonel Garrison, which the Secretary was instructed to prepare, follows:

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* Held at Haddon Hall, Atlantic City, N. J., May 6, 1935.

It would be difficult to overstate the services that Fielding Hudson Garrison rendered to medical history. He will probably be best remembered for his textbook, known in its four editions throughout the world as the outstanding work in English on the subject, and the best one-volume History of Medicine in any language. In its successful combination of readability with a wealth of historical detail, it is unsurpassed. Equally useful, even though less conspicuous, were his long and devoted services to the magnificent catalogue of the Surgeon-General's Library, the Index Medicus and the Quarterly Cumulative Index Medicus. A tremendous capacity for work coupled with a punctiliously conscientious discharge of his duties as an officer of the United States Army produced a volume of achievement that has seldom if ever been equalled in his field. Nor should be forgotten his ever ready help to beginners and his catalytic suggestions to toilers in the field in which he was a master, his delightful and piquant essays on medical topics in the Bulletin of the New York Academy of Medicine and in published volumes, and his unremitting toil and sage leadership in the libraries with which he was connected. More difficult to evaluate is the effect that his love for and knowledge of music had on his life work. Seldom did his conversation fail to include comments about or illustrations from musical matters, remarks that both revealed his artistic temperament and demonstrated how thoroughly saturated were his thoughts with the musical point of view. With his death, the medical world loses one of its greatest scholars, America its greatest medical historian and this Association one of its most distinguished ex-Presidents. Stricken in the fullness of his intellectual power, he leaves a great void to which this Association bears witness in this minute.

BOOK REVIEWS

A Bibliography of the Poem Syphilis Sive Morbus Gallicus. By Girolamo Fracastoro of Verona. By Leona Baumgartner and John Fulton. New Haven, Yale University Press, 1935.

This scholarly work will be duly appreciated by bibliographers and collectors as well as by medical historians. It is compiled on the lines followed by one of the authors, Dr. J. F. Fulton, in his splendid bibliography of the Honorable Robert Boyle. This work fully equals the high standard of its predecessor. Of the great service to the medical historian of such compilations the recently published bibliographies of William Harvey and Sir Thomas Browne, by Keynes, are notable examples. The bibliography of Fracastoro is especially timely because of the great interest which has recently been renewed in the Italian physician who anticipated the modern science of bacteriology, and was the godfather of one of the most dreaded diseases. In a most delightful, but all too short introduction, Dr. Arnold Klebs suggests that Fracastoro cast his immortal work in verse because he was a poet who gazed upon this catastrophic plague which smote Europe with such sudden and widespread horror, not merely as an epidemic disease but somewhat with the sorrow and despair with which the World War struck so many moderns.

As an indication of the widespread esteem and popularity of Fracastoro's great poem, the first edition of which appeared in 1530, there are no less than forty-five editions in Latin, eleven of them included in the "Opera Omnia." No Italian translation was published until 1731, fourteen years after the publication of Nahum Tate's English version in 1686. In the present century several new English translations have been published, the latest a prose rendering by Wynne-Finch appearing in the current year. There are not so many translations into German or French.

A few years ago there was published an excellent translation by Mrs. Wilmer Cave Wright of Fracastoro's work on contagion. Thus there is available for the English reader all the more important writings of this great physician and humanist, and needless to say they are very good reading. We congratulate the authors of this valuable addition to our knowledge of the work of a most interesting author and on the splendid achievement of a hard task.

Some Notable Epidemics. By H. Harold Scott, M.D., F.R.C.P., etc. With Preface by W. W. Jameson, M.A., M.D., etc. Balt., William Wood and Co. 1934.

This very practical and most interesting book deals with a number of very notable epidemics of various diseases, enteric fever, diphtheria, scarlet fever, food poisoning, dysentery, which have occurred in England and Scotland between the cholera outbreak at Westminster, London, in 1854 to the outbreaks of dysentery in certain parts of London in 1933. In the introduction the Author offers a very sufficient apologia for his work and explains his selection of the epidemics he has chosen to describe in what he aptly terms this "Anthology" of epidemics. He has chosen such as were of historical importance in the history of epidemiology, or exhibited points of particular interest in the development of the study of epidemiology and has used his material to illustrate how such epidemics were studied and combatted in pre-bacterial days, and how the ideas and methods of the profession in regard to such epidemics stand in the light of our modern knowledge. The arrangement of his material is interesting and original. Instead of considering the epidemics in arbitrary chronological order Dr. Scott has chosen to arrange his chapters according to the mode of conveyance of the disease, and only occasionally according to time sequence, as in instances where separate epidemics of the same disease occurred simultaneously or in quick succession. There is no field of medical science in which the development of the science of bacteriology has wrought greater changes than in the study of epidemic or contagious disease and Dr. Scott has done great service in this study of quite recent epidemics which were studied and combatted by the best methods known in their time in contrast with what we know about them and what would be done under similar circumstances today. By confining himself to epidemics which occurred in one country and were handled by the best available means of the day he has enhanced greatly the practical value of his book.

THE CHINESE MEDICAL JOURNAL. Vol. XLVIII, No. 12, December, 1934. Published monthly by the Chinese Medical Association. Peiping, China.

This issue of this most valuable periodical, the "Official Organ of the Medical Profession of China," is designated the "Davidson Black Memorial and Anthropology Number" and is a worthy tribute to the memory of the late distinguished Professor of Anatomy in Peiping Union Medical College. The contents include, beside a number of valuable contributions on anatomy and anthropology written by some of Professor Black's associates and students, a bibliography of his own writings, and a reprint of the Croonian Lecture delivered before the Royal Society of London in 1932 in which he described the discovery of the remains of Sinanthropus pekinensis, the so-called "Pekin man." Although Black's name will always be justly associated above all others with the great find his description of the steps in the discovery are written with a delightful modesty attributing due credit to all the workers who participated in the labor of recovering and identifying the scattered fragments from the bed in which they had lain concealed for so many thousands of years. Dr. Black was not only a great scientist but a wonderful personality. Until the sensational discovery of the "Pekin Man" and the publication of the scientific studies incident thereto the name of Davidson Black was but little known except by workers in his special field and by his associates in China. His numerous valuable contributions to scientific literature were buried in special publications. It is to be hoped that at some time in the future the life story of this truly great scientist may be more generally made known.

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Editor: FRANCIS R. PACKARD, M.D., Philadelphia

CONTENTS OF NEW SERIES, VOLUME FOUR, 1932

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CONTENTS OF NEW SERIES, VOLUME FIVE, 1933

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CONTENTS OF NEW SERIES, VOLUME SIX, 1934

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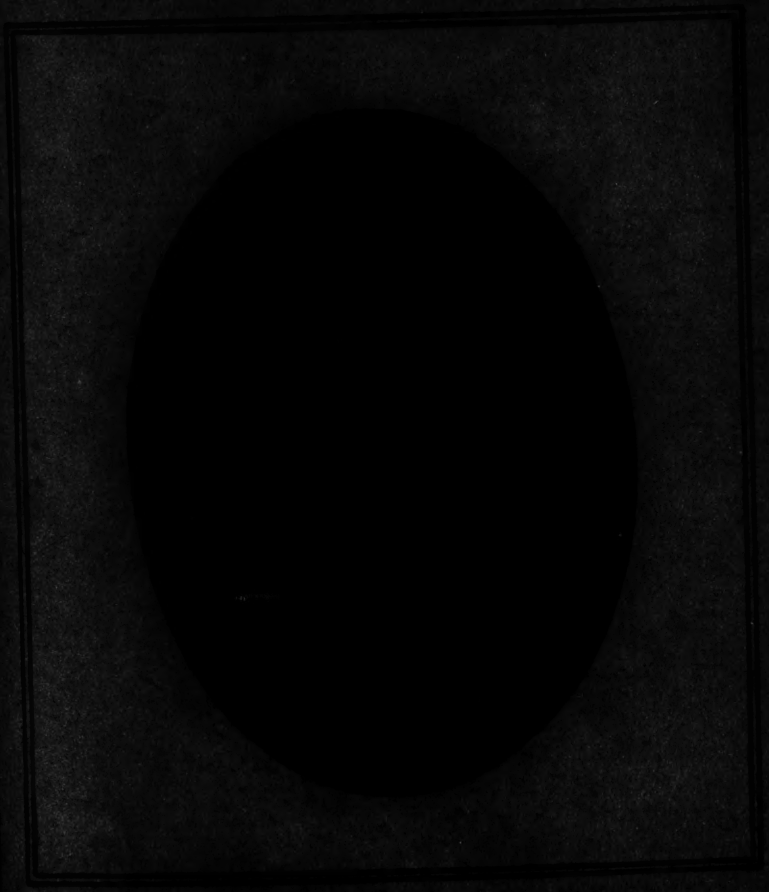
VOL. 7 · 1935 · NO. 5 · SEPTEMBE

ANNALS OF
MEDICAL HISTORY



ANCIS R. PACKARD, M.D. EDITOR (PHILADELPHIA)
UBLISHED BIMONTHLY BY PAUL B. HOEBER · IN
EVENTY-SIX FIFTH AVENUE · NEW YORK · N.Y.

Entered as second class matter June 2, 1917, at the post office at New York, N. Y., under the Act of March 3, 1879.
Yearly Subscription, $10.00. Single numbers, [illegible]

ANNALS OF MEDICAL HISTO

Editor: FRANCIS R. PACKARD, M.D., Philadelphia

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